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# USSR Report

## HUMAN RESOURCES

No. 73



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# USSR REPORT

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LABOR

# UZBEK LABOR OFFICIAL INTERVIEWED ON NEW STATUTE

Tashkent EKONOMIKA I ZHIZN' in Russian No 8, Aug 82 pp 16-19

[Interview with Oleg Pavlovich Apostolov, deputy chairman, UzSSR State Labor Committee: "Realizing the Right to Work"]

[Text] Job training, occupational orientation, choice of an occupation, training in the field, adaption to the production sphere, labor activities--one can not merely list all the aspects of a very complicated process: involvement of young people in the national economy. To control this process we must study and take into account a multitude of economic, social and psychological factors.

The effectiveness of our work in the republic has increased significantly in recent years. But life presents us with new, increased demands on the preparation of a young work shift. Therefore, Uzbekistan has developed, and since January has had in effect, a new "Statute on Specialized Employment in the Uzbek SSR of Nonspecialized Middle School Graduates and Youth without Middle Education". We asked O. P. Apostolov, deputy chairman of the UzSSR State Labor Committee, to comment on this document and to respond to some questions from our readers.

[Interviewer] Oleg Pavlovich, in our republic we have layed down a grandiose program for social and economic development for the 11th Five-Year Plan and until 1990, in the context of which the national economy will have increased labor force requirements. What are these requirements and how will they be met?

[Apostolov] The hundreds of production facilities put into service in industry, construction, and agriculture, and the expansion of coverage of public service will require an additional 400,000 to 500,000 workers each year. The need is tremendous, of course, but it can be satisfactorily met.

First of all, our demographic situation in Uzbekistan is extremely propitious in this regard: our high rates of net population growth ensure that we will not have to fear a worker shortage at least for the next 15-20 years.

Secondly, the villages and small and medium-sized cities have a rather large reserve of employable persons.

Thirdly, production improvements and the incorporation of scientific and technical advancements will release workers for other jobs, particularly in agriculture.

These and many other factors are establishing the major prerequisites to accelerate the development of major sectors of the national economy to implement the Food Program.

But we also have to solve certain problems in this connection: moving the employable population, redistributing the labor force to production areas, raising the qualifications and re-training workers, and many others. The main thing is vocational training of young people. You know, more than half of the annual labor force requirement is met by young men and women who have reached working age. So when we speak of the efficient utilization of labor resources, we must clearly keep this group in mind.

[Interviewer] The USSR Constitution legally guarantees Soviet citizens the right to work and choose a vocation, type of employment and job according to vocation, abilities, vocational training, education and the needs of society. How are these rights being implemented?

[Apostolov] Actually, any effort aimed at developing production forces and their efficient distribution relates directly to the exercise of the right to work. We are expanding production, opening up enterprise branches and shops in areas with concentrated labor resources, stimulating the population to migrate, and doing a great deal more so everyone has a job opportunity, to work in his or her chosen occupation. We are guaranteeing this right with free technical vocational education, establishment of conditions for raising qualifications, mastery of new and allied specializations, and development of a system of occupational orientation and specialized employment.

The republic now has 519 technical vocational institutions training qualified workers in nearly 300 specializations. Over 233,000 young men and women are being taught there. The overwhelming majority of them are receiving general middle educations in addtion to vocational training.

An even more extensive form of vocational training is on-the-job training in the instructional course network and in individual and group apprenticeships. These individuals are mainly young people who entered industry without technical vocational training, as well as those wishing to change occupations. Each year about 300,000 men are being trained, with roughly the same number undergoing advanced training.

I must note that regulation of the influx of young people into the national economy is still not effective enough. The choice of an occupation and specialized employment of young people are often random and are influenced by subjective factors. As a result, there is job dissatisfaction, personnel turnover, and low work evaluations. Both the individual and the national economy suffer. So a lot of attention is now being focused on occupational orientation and specialized employment of young people.

[Interviewer] Tell me, please, who determines youth labor and how is it defined?

[Aposotolov] The "Statute on Specialized Employment of School Graduates in the Uzbek SSR", in force since 1972 and until recently, did not formulate the individual organizational details of specialized employment with sufficient clarity; there was no definition of how the ministries, state committees, agencies and management organizations were to involve young people in public production, to carry out occupational orientation, to create the conditions necessary for the continuing education of young workers, to procure occupations and growth in occupational skills and help young people adapt to collective labor groups.

These and many other problems related to youth labor definition were reflected in the new edition of the "Statute" that went into effect this year. In specifically states: "Work arrangements for middle non-specialized school graduates and young people who did not attend middle school, at enterprises, institutions, organizations, kolkhozes and sovkhozes located in the Uzbek SSR, regardless of agency affiliation, are being made by the Council of Ministers of the Karakalpak ASSR, the executive committees of the oblast, rayon, urban, urban-rayon Councils of Peoples' Deputies in cooperation with labor agencies, with the participation of public organizations, on the basis of the indicators of specialized employment of youth approved in the annual economic and social development plans, and on the basis of local council executive committee assignments set for enterprises, institutions and organizations. The indicators for these plans and assignments have been elaborated with the participation of planning commissions and labor agencies".

The fundamental applied work on specialized employment is being done by the UzSSR State Labor Committee and its on-site agencies which, in collaboration with public organizations commissioned by the appropriate Council of Peoples' Deputies' executive committee, are issuing permits for work or training at vocational training centers.

Special commissions have been set up in the local Councils of Peoples' Deputies' executive committees to organize and perform work on labor definition of middle non-specialized school graduates. Their duties include the following: coordination of the activities of state and public organizations for the fullest involvement of school graduates in public production; monitoring of the preparations made at enterprises, sovkhozes, kolkhozes, construction and other organizations to receive young reinforcements, and the establishment of the conditions he will need for working, living, and occupational opportunities.

The specific tasks for local agencies are set in the annual joint resolutions of the State Labor Committeee, State Occupational Education Committee, UzSSR Ministry of Education, and the Uzbekistan Komsomol Central Committee.

The entire labor agency system helps figure out the labor resource balance, regulates acceptance of young people on the job, cooperates with management agencies to compile and disseminate information and reference materials about major national economic facilities, their personnel requirements, and furnishes these data to non-specialized education schools.

Labor definition work for graduates of the 8th-10th grades of non-specialized schools is set up to allow most of them to be assigned to for vocational training at institutes which have the greatest opportunities for high-quality preparation of highly-skilled workers.

The UzSSR State Labor Committee, its occupational consulting and youth occupational choice offices and local labor agencies take part in all youth occupational orientation work, job profession propaganda and the elaboration of steps to enhance its efficiency. State control is imposed on labor agencies over the use of youth labor at enterprises and organizations regardless of agency afiliation; over the implementation of measures to reduce turnover and the establishment of conditions to enhance the occupational and non-specialized educational level of young workers. These goals, in particular, are served by the coordinated plan for occupational propaganda and the thematic plan for publishing occupational orientation guidance literature; more than two dozen organizations, publishing houses and radio and television editorships are directly involved in their fulfillment.

The national economy's personnel requirements throughout the republic as a whole are determined by the UzSSR State Planning Committee in cooperation with ministries and agencies; the State Planning Committee of the Karakalpak ASSR, oblast planning committees and Tashkent city planning committee cooperate with the appropriate labor departments and vocational school administrations to figure out five-year and annual personnel requirements in the mass occupations. These data are also need to determine the labor instruction profile at schools, interschool industrial training centers (UPK) and for specialization of vocational and technical institutions.

Management agencies, enterprises and organizations are given a special place in the overall specialized youth employment system; this is quite natural, since they are the primary "users" of the labor force.

[Interviewer] In this context, what can we say about their goals?

[Apostolov] Enterprises and organizations accepting young people for jobs allocate the youth jobs in advance, submit information to labor agencies, and they in turn inform the schools of upcoming needs for

young workers and other information. In the current year, 4,546 management organizations will be accepting middle school graduates and have already set aside some 142,732 jobs. As a top priority, young people are assigned to especially important national economic facilities in operation or under construction.

As set forth in the "Statute", it is important that young men and women go to work with top-notch groups. They should be helped to select and master an occupation, increase their skills, and the conditions should be established for highly productive labor, social and occupational adaptation.

The turnover of young personnel in production has dropped off in recent years.

Ther is still too much movement in the labor force: in 1981 a rather large number of workers left the production and construction fields, on their own volition and in violation of labor discipline. Two-thirds of them were young people less than 29 years of age.

The "Statute" therefore guides enterprises and organizations to seek means for further improvement of labor efficiency of young personnel, to study reasons for turnover, violations of labor and social discipline. Labor agencies must report on specialized employment jobs and retainabilty of young people at enterprises on an annual basis.

[Interviewer] The school has been made more responsible for the fate of its pupils in the preparation of young people for work and the choice of occupation. This must also have been reflected in the "Statute", true?

[Apostolov] Yes, today pedagogic activities are evaluated more in terms of the end results. This means that the middle mark of good results also contains additional criteria, such as the level of job training, a conscious approach to choice of livestyle, the ability to orient oneself in the world of occupations. We'll surely soon see the time when a school's work efficiency and its links with production will be determined by indicators such as the occupational adaptation of its graduates, their retainability in the labor collective. In other words, more young worker quality will be demanded from both pedagogic groups and from interschool industrial training centers.

In this context, the "Statue" imposes an obligation on non-specialized schools and interschool industrial training centers to provide vocational consultations for students, to take other steps to prepare school graduates for a choice of an occupation; to familiarize them with the job list published by enterprises, institutions and organizations, kolkhozes and sovkhozes, the nature of the impending job, labor conditions, and labor legislation governing youth labor; to find students in graduating classes who wish to go to work immediately after finishing school, and convey this information to the labor agencies.

The role of the national education departments of the Councils of Peoples' Deputies executive committees in preparing young people for work

and the specialized employment of school graduates is being increased. Their oblgations now include smooth and systematic occupational orientation and job training of students, supervision of these activities in schools and at interschool industrial training centers.

[Interviewer] Occupational orientation work in the country has recently been broadened with the use of different forms and techniques? What are their distinctive features in Uzbekistan?

[Apostolov] Our republic is the first in the land to begin--and many leading experts feel with complete success--to conduct a major socio-economic experiment: the creation of an integrated system of labor resource management using scientific principles and methods of occupational orientation.

This system now includes a branching network of councils and offices (laboratories, bureaus) of occupational orientation at all different levels: from the ministries to the enterprises and schools. Over 200 of these offices are staffed with released regular workers.

In all oblast, city and rayon departments of national education, labor instruction and occupational orientation positions have been introduced.

We now have 400 interschool industrial training centers in operation, propaganda of work professions has been improved, as has the publishing of occupational orientation literature.

All of this is already beginning to show. For example, pupils now willingly attend vocational institutions, more rural youth are going into non-agricultural sectors, especially industrial enterprises. Work with young people in labor collectives has been improved, and a trend has been observed toward increased job retainability.

As the experiment proceeds today, occupational charts are being drawn up in terms of the basic occupations, systems of scientifically justified occupational selection are being completed and incorporated at enterprises, the economic, social and psychological aspects of labor adaptation of young people are being studied, and the effects of various factors on selection of occupation are being investigated.

There are weak points in the overall system of occupational orientation management: not enough experts and techniques, not enough persistance in this work, and some supervisors do not fully comprehend the importance and necessity of working with young people in this direction. Everyone must clearly be aware of the final goal: effective utilization of labor resources and total implementation of the Soviet citizen's right to work.



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## FUNCTIONS OF MATERIAL INCENTIVE FUND DISCUSSED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 10, Oct 82 pp 63-71

/Article by I. Danilov, deputy chief of the planning and economic administration of the Ministry of the Machine Tool and Tool Building Industry: "Material Stimulation to Adopt a More Difficult Plan"/

/Text/ The 26th CPSU Congress has earmarked a broad program for the development of the country's economy during the 1980's. Successful implementation of this will depend largely on more active utilization in the economic mechanism of the principle of material incentives and, on the basis of this, improvement of the existing system of incentives. The viability of this principle under socialism was scientifically substantiated by V. I. Lenin, who pointed out that socialism must be constructed not only on the direct enthusiasm of the workers, but, with the help of this enthusiams, on the personal motivation of the workers.*

The mechanism for the formation and expenditure of material incentive funds is a major organizational and economic lever which can be used, depending on the assigned goals, to stimulate either fulfillment (overfulfillment) of the plan or its difficulty. Before the economic reform of 1965 preference was given to stimulating the fulfillment (overfulfillment) of the plan. The enterprises created the director's fund from deductions from the planned (up to 2 percent) and above-plan (30 percent) profits. The deductions were made when the plan for the output of products was fulfilled in terms of the list of products, production cost and profit.

After the 1965 reform, during the course of the 8th-10th Five-Year Plans, improvement of fund formation was a process of gradual development of the economic mechanism and the most important part of it--the system of material incentives. The latter was called upon the motivate the production collectives not only to fulfill and overfulfill the plans, but also to increase the difficulty of the annual planned assignments within the five-year plan and, on the basis of this, to increase the efficiency of production.

*See: V. I. Lenin, "Poln. sobr. soch." /Complete Collected Works/, Vol 4, p 151.

The mechanism for material incentives that is presently being applied has been functioning since 1981. The introduction of this mechanism is directed, on the basis of the development of socialist competition and the utilization of intrabusiness reserves, toward creating motivation for the enterprises to adopt counterplans that surpass the assignment of the five-year plan for the given year. The promptness of the development of drafts of the plans and the enterprises' participation in this are most important conditions for its functioning. In keeping with the basic provisions concerning the formation and expenditure of the material incentive fund and the fund for social and cultural measures and housing construction (incentive funds) in 1981-1985 in industry* the absolute amounts and normatives for the formation of material incentive funds are established for the ministries, associations and enterprises by the USSR Gosplan as part of the control figures for the five-year period with a breadkown for the various years. For machine building enterprises the main fund forming indicators are increased labor productivity and an increased proportion of products of the highest quality category in the overall volume of production.

The normatives for the formation of the material incentive fund, which are obtained by sequentially dividing the absolute amount of this fund by the numberical value of the fund forming indicators and then by profit constitutes a third indicator of fund formation. With an increase (reduction) by the ministries, associations and enterprises of fund forming indicators in the draft of the five-year plan as compared to the control figures or in the draft of the annual plan as compared to the assignment of the five-year plan for the give years, the absolute amounts of the material incentive funds are adjusted correspondingly.

During the course of the year the absolute amounts of the material incentive fund increase (decrease) depending on the enterprise's fulfillment of the plan in terms of the established fund forming indicators: labor productivity, the proportion of products of the highest quality category, profit, and fulfillment of commitments for deliveries. The level of fulfillment of the plan for deliveries in keeping with agreements that have been concluded has become the fourth main indicator for evaluating the economic activity of associations and enterprises, its application being directed toward strengthening contractual discipline and improving the balance of state plans at the local level.

Beginning in 1983 the five-year and annual plan for the enterprises will set assignments for reducing production costs and as part of the latter, limits on material expenditures on monetary terms per 1 ruble of commodity output. With a reduction of material expenditures as compared to the plan, direct additional deductions will be made into the material incentive fund as a result of the savings that have been achieved. This will make it possible to reduce expenditures of raw materials, process materials and electric energy per unit of products produced.

*See: "Sovershenstvovaniye khozyaystvennogo mekhanizma" [Improvement of the Economic Mechanism], Moscow, Pravda, 1980, pp 142-160.

Despite the significant improvement in the mechanism of fund formation resulting from the economic reform, it has a number of shortcomings. The main one is that the motivation is first of all to fulfill planned assignments and there is little stimulation for the collective to adopt more difficult plans.

At the November (1981) Plenum of the CPSU Central Committee, General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet, L. I. Brezhnev noted that it is not economically advantages for the enterprises and associations to adopt more difficult plans. It seems to us that the system of material incentives should be directed toward overcoming this negative phenomenon. Without affecting methods of planning, the development of material balances or plans for the distribution of products, it should provide for the creation of economic incentives to increase the difficulty as a plan as a result of the adoption of counterplans from below by the labor collectives and contribute to accelerated increase in the output of products, increased efficiency of the utilization of production resources and also a correct evaluation of the operation of the enterprises.

At the present time the amounts of the material incentive fund included in the control figures for the five-year period are determined by distributing the absolute volumes of this fund among the various branches, associations and enterprises. They depend not on the assignment for fund forming indicators, but on the proportion of salaries of engineering and technical personnel and employees in the overall wage fund (the higher it is the larger the material incentive fund that is established for the enterprise in the control figures of the five-year period). Moreover, as a rule, the amounts of material incentives in the past are not used to calculate these amounts. Thus a better position is created for enterprises that have reduced the plan in terms of product output and increased it in terms of the volume of centralized capital investment, labor-intensiveness of products and expenditures on materials. In other words, with such a system the enterprises do not have economic motivation to develop more difficult plans.

And if the enterprise has nonetheless adopted a more difficult plan and has not fulfilled it, while still providing for an increase in the output of products and other fund forming indicators, it is included among the backward ones. At such enterprises deductions into the material incentive fund are reduced, as a result of which bonuses are reduced and, as a rule, labor turnover increases and the stability of production collectives decreases. Therefore the following tendency now prevails among certain managers of enterprises: to obtain as many capital investments as possible, to increase material and labor expenditures in the plan, and to be the leader as a result of the fulfillment of a less difficult plan. The higher economic agencies are trying not to allow such phenomena, but this is achieved most frequently with the help of administrative and not economic methods of control.

In the process of fulfilling plans the enterprises have difficulties in obtaining material and technical resources from the suppliers as a result of violations of delivery plans. This situation also causes the enterprises to cover their own reserves and approve plans which are less difficult to fulfill.

Further, the existing system of material incentives establishes a number of conditions and limitations on the expenditure by the enterprise of the material incentive funds they have received. Thus bonsuses paid to engineering and technical personnel and employees for fulfillment and overfulfillment of the plan, according to existing systems of awarding bonuses, cannot exceed 50 percent of their salaries. The dependency of the system of bonuses on a multitude of factors that are unrelated to the activity of the specific workers frequently gives rise among them to a lack of confidence in how real material incentives are.

A number of circumstances sometimes lead to adjustments in planned assignments in the direction of reducing them, as a result of which the difficulty of the plan decreases. The lack of a material incentive mechanism that takes into account changes in the difficulty of the plan causes the higher administrative agencies, when adjusting the plans, to simply deprive enterprise management workers of bonuses for the results of the economic activity (from 50 to 100 percent). Such a policy is envisioned by the bonus provisions of the majority of associations and enterprises for workers of divisions and services of plant administration, which also reduces the effectiveness of material stimuli.

With this kind of material incentive mechanism the personal labor contribution of each worker to the final results of the economic activity of the enterprise is not adequately taken into account. Frequently workers who receive bonuses do not know precisely why.

The existing system of stimulation lacks such an important fund forming indicator as output-capital ratio (the net output of products per 1 ruble of value of production capital). This was suggested by soviet economists as early as the 1st Five-Year Plan but was not applied in practice. The lack of the indicator of output-capital ratio in planning production and material stimulation has a negative effect on the efficiency of the utilization of fixed production capital and the load on the fleet of equipment. For example, the duration of the operation of the fleet of metal cutting machine tools averages 1.2 shifts. And the workers are providing for less and less installed equipment. It seems to us that the introduction of the indicator of the output-capital ratio into the system of material incentives would increase the motivation of the enterprises to reduce the output of products as a result of improvement of the utilization of the funds and that production would be increased more efficiently as a result of new capital construction.

Finally, the existing fund forming mechanism is cumbersome: The formation of the material incentive fund has several stages (the development of the control figures for it, the preparation of the draft of the five-year plan, the formation of the five-year plan, the drawing up of annual plans and the actual formation of the fund). And in all of these stages the material incentive fund is formed according to different individual normatives. Such complexity of the fund forming mechanism does not arise out of objective necessity. And after 1983, with the introduction of additional direct deductions into the material incentive fund for economizing on material resources the fund forming mechanism will be even more complex. Therefore a primary condition for improving the mechanism for incentives is to simplify it. In our opinion we

should also cease as quickly as possible to use a comparative approach to the planning and formation of the material incentive funds. In the planning stage their amounts should depend on the difficulty of the plan adopted by the enterprise and when they are actually deducted they should depend on the results that are achieved.

There is no doubt about the need to account for the difficulty of planned assignments in the system of fund formation. But the existing system of evaluating the difficulty is applied only for the substantiation of the plan when it is approved and is in no way related to material incentives.

The USSR Gosplan has approved methodological instructions concerning the policy for determining the difficulty of the plans of the enterprises.* It is recommended that the following indicators be applied: the utilization of production capacities (spaces); labor productivity (output per 1 workers); proportion of products of the highest quality category in the overall volume of production (or another indicator of quality); and production costs (profit as a result of reducing production costs). If necessary it can also be allowed to use such indicators as shift operation of equipment, its loading, output-capital ratio (overall or active part of the capital), material-intensiveness of products (or proportional expenditure of materials per unit of capacity, work), and other indicators that are specific for individual branches (industries).

The level (coefficient) of difficulty in terms of each indicator is determined by dividing the envisioned amount of the planned indicator by its normative value. The normative level of the indicator should be calculated on the basis of a system of progressive, scientifically substantiated technical and economic norms and normatives. It is recommended that the difficulty of the plan be evaluated in terms of one or two leading indicators, and the levels of the other indicators should be taken into account as additional criteria.

Unfortunately, the given methodological instructions have not been applied in practice and have not had an effect on the improvement of planning. This is because we have not found ways of calculating scientifically substantiated normatives (normative levels of indicators) with which to compare the planning indicators of the enterprises when determining their difficulty. A situation has arisen wherein one unknown--the plan--is determined on the basis of another unknown--the normative amount of this plan. Without mastering methods of drawing up difficult plans that envision the mobilization of all existing production reserves it is difficult to solve the problem of how difficult the plan is, relying on the normative level of indicators since methods of determining them are also unknown.

In our opinion, the most reliable method of evaluating the difficulty of a plan is to compare the planned and base level of a particular system of indicators. As a base level one should use the average values of indicators for three years preceeding the year that is being planned. For example, in machine building the difficulty of the plan can be evaluated by this method

*See: "Sovershenstvovaniye khozyaystvennogo mekhanizma," pp 37-39.

in terms of the following fund forming indicators: labor productivity (in terms of net output); output-capital ratio; and the proportion of products of the highest quality category in the overall volume of commodity output. These indicators reflect the effectiveness of the utilization of all kinds of resources: live labor, materials and production capital.

The indicator of net output should be calculated by subtracting material expenditures from commodity output. It reflects both the amount of the volume of production in physical terms and the savings on material resources; therefore net output is the final indicator of the economic activity of any enterprise. At the same time in the system of production administration one should use the indicator of normative net output which has the undoubted advantage that it makes it possible to obtain on the spot figures concerning the volume of production taking labor expenditures into account. Moreover it can be used successfully in intra-industry autonomous financing within the framework of production associations. Each indicator augments the other.

Let us consider the mechanism for the formation of the material incentive fund at an enterprise on the basis of the indicators of difficulty that have been suggested. It is essentially a calculation of the base rate for deductions into the material incentive funds and its adjustment depending on the earmarked changes in fund forming indicators for the planned year as compared to their average value during the three preceeding years and a determination of the absolute amount of the material incentive fund included in the plan for the given year.

The base rate is the ratio between the material incentive fund for the past year and the planned wage fund for that same year. It is calculated in percentages and individually for each enterprise. On the basis of the base rate one determines the planned rate which provides for the succession of levels of material incentives in the base and planned periods.

The adjustment of the base (calculation of the planned) rate consists in increasing (reducing) its amount on the basis of changes in the rates of increase of the numerical values of fund forming indicators for the given planned year as compared to their base level for the three preceeding years. For each fund forming indicator one establishes normatives of adjustment of the base rate that are the same for all associations and enterprises of the branch; they should be revised no more frequently than once every 5 years.

The amounts of the normatives for adjusting the base rate for each fund forming indicator should be calculated for 1 percentage point of their increase in the five-year plan and the permissible increase in the labor fund (wage fund and material incentive fund) for the five-year period. Then one of the fund forming indicators can take priority over others within the limits of the earmarked increase in the material incentive fund based on the main tasks of the five-year plan (increased labor productivity, increased output-capital ratio, and a higher technical level of products that are produced).

The figures in Table 1 can serve as an example of calculations of the planned volume of the material incentive fund.

Table 1. (in %)

| Fund-forming Indicator | Adjustment normative | Increase over last year, in various years | | | Average annual increase during 1979-1981 | Increase in 1982 Plan | Deviation from base level (Increase +, decrease -), points |
|---|---|---|---|---|---|---|---|
| | | 1979 | 1980 | 1981 | | | |
| Labor productivity | 5 | 5.7 | 4.9 | 5.3 | 5.3 | 6.5 | +1.2 |
| Output-capital ratio | 3 | 0.2 | 1.8 | -0.5 | 0.5 | -0.4 | -0.9 |
| Proportion of products of highest quality category | 2 | 42.8 | 42.5 | 43.7 | 43.0 | 44.6 | +1.6 |

Let us say that the base rate for deductions into the material incentive fund during 1981 was 9.2 percent. We determine the planned rate for 1982 thus:

$$9.2\ \frac{100 + 1.2 \cdot 5 - 0.9 \cdot 3 + 1.6 \cdot 2}{100} = 9.8 \text{ percent.}$$

And the material incentive fund with the planned wage fund being 7.2 million rubles will amount to:

$$\frac{9.8 \cdot 7200}{100} = 706{,}000 \text{ rubles.}$$

Thus the given mechanism makes it possible to establish the amount of the planned material incentive fund of each enterprise depending on the difficulty of the plan in terms of the indicators that are adopted. Thus the growth of the material incentive funds of all associations and enterprises is equal to the planned growth of the material incentive fund for the branch as a whole. Herein lies the advantage of the proposed mechanism over the one that is presently in effect, which is based on the distribution of the overall material incentive fund among associations, enterprises and branches regardless of the difficulty of their planned assignments.

The actual deductions from profit into the material incentive fund throughout the year depending on the results that have been achieved should be made according to the same policy and with the same normatives as are applied in the example given above for determining the planned fund. Thus the actual rate of deductions into the material incentive fund should be calculated by adjusting the base rate depending on the changes in the numerical values of the fund forming indicators and not in terms of deviation from the plan. This will make it possible not to create special normatives for adjusting the base rate in keeping with the fulfillment of the plan in terms of fund forming indicators, and it will make the entire fund forming mechanism more reliable and more efficient. Throughout the year the material incentive fund should be determined for each quarter, half year, nine months and year with a cumulative total, and deviations from these assigned numerical values of the fund forming indicators as compared to the base levels for the given periods should be accounted for annually.

Let us give an example of deductions from profit into the material incentive fund throughout the year on the basis of the provisions that have been presented (Table 2).

Table 2. (in %)

| Fund-forming Indicator | Adjustment normative | Average annual increase, 1979-1981 | Increase in 1982 plan | Actual increase over base level | | Deviation from base level (Increase +, decrease -), points | |
|---|---|---|---|---|---|---|---|
| | | | | 1st Half of 1982 | In 1982 | 1st Half of 1982 | In 1982 |
| Labor productivity | 5 | 5.3 | 6.5 | 6.2 | 6.3 | -0.9 | +1.0 |
| Output-capital ratio | 3 | 0.5 | -0.4 | 0.3 | 0.5 | -0.2 | -- |
| Proportion of products of highest quality category | 2 | 43.0 | 44.6 | 43.8 | 45.0 | +0.8 | +2.0 |

The base rate of deductions into the material incentive funds is 9.2 percent. We determine the actual rate of deductions into the material incentive fund for the first half of 1981 as follows:

$$9.2\ \frac{100 + 0.9 \cdot 5 - 0.2 \cdot 3 \quad 0.8 \cdot 2}{100} = 9.71 \text{ percent;}$$

and for 1982:

$$9.2\ \frac{100 + 1.0 \cdot 5 + 2.0 \cdot 2}{100} = 10.3 \text{ percent.}$$

The actual deductions into the material incentive fund, with a planned wage fund for 1982 of 7.2 million rubles, including 3.6 million rubles in the first half year, and based on other conditions of our example will be: for the first half of 1982:

$$\frac{9.71 \cdot 3600}{100} = 349{,}600 \text{ rubles;}$$

for 1982:

$$\frac{10.03 \cdot 7200}{100} = 722{,}200 \text{ rubles.}$$

It is known that the balance profit is an important indicator of the economic activity of enterprises and the only source of formation of their incentive funds. Therefore the calculated material incentive fund should be increased in proportion to the degree of fulfillment of the plan for profit, that is, profit should be used for the actual calculation of the funds as a fund-adjusting indicator. The utilization of profit for these purposes is not presently envisioned when forming the planned material incentive funds.

If in our example we should say that the plan for profit for the first half of 1982 was fulfilled by 98 percent and for 1982 as a whole by 103.2 percent, the actual deductions from profit into the material incentive fund would be: for the first half of 1982,

$\frac{349.6 \cdot 98.0}{100}$ = 342,600 rubles, and for 1982, $\frac{722.2 \cdot 103.2}{100}$ = 745,300 rubles.

Such are the basic principles we suggest for the fund-forming mechanism, taking into account the difficulty of the planned assignments. They ensue from the need to improve the economic mechansim on the basis of the provisions of the decree of the CPSU Central Committee and the USSR Council of Ministeres of 12 July 1979 and also the provisions formulated by the 26th CPSU Congress concerning the fact that the results of production should increase more rapidly than expenditures on it. A number of elements of the proposed system for improving fund forming on the basis of accounting for the difficulty of the plan--selection of fund forming indicators, the determination of the normatives for the adjustment of the base rate and others--need to be refined. But the mechanism for forming the material incentive fund itself is prferable to the existing one. In the first place it established a rigid functional dependency between the amount of the material incentive fund, on the one hand, and the difficulty of the plan and the results that are actually achieved, on the other. In the second place, the enterprises have greater material motivation to adopt and fulfill more difficult plans, which in the final analysis should lead to improvement of the utilization of all intrabusiness resources and increased production efficiency. In the third place, the fund forming system is simplified while at the same time it becomes more objective and effective.

The introduction of the output-capital ratio (one of the criteria for evaluating the difficulty of the plan) into the incentive mechanism as a fund forming indicator should provide for: improving the utilization of production capital and taking better care of it; increasing the load on equipment and reducing the time interval between when it becomes obsolete and when it wears out; and establishing in industry a policy whereby highly productive machines and equipment that correspond to the best domestic and foreign models will be produced.

It is important not only to calculate the material incentive fund objectively, but also to utilize it efficiently. To do this it is necessary for the associations and enterprises to have bonus provisions which are individual to the greatest degree and optimally take into account the results of the labor of each worker and the collective as a whole. At the same time material stimulation of the results of the work of individual subdivisions should not depend on the indicators of the activity of the enterprise, since they determine only the overall amount of the material incentive fund of the given enterprise and not the results of the work of its individual subdivisions.

Efficient utilization of the material incentive fund has been achieved, for example, at a number of enterprises of Krasnodarskiy Kray where a comprehensive system of increasing production efficiency is being applied. It was developed on the initiative of the Krasnodarskiy party kraykom and approved by the CPSU Central Committee. The decree of the CPSU Central Committee of 22 February 1977, "On the Organizational and Political Work of the Krasnodarskiy Party Kraykom for Implemening the Decisions of the 25th CPSU Congress," points out the need to organize everywhere the development of a comprehensive system of increasing production efficiency which was begun at enterprises of the kray.

The Krasnodarskiy system is a multipurpose complex of measures developed in the form of standards of the enterprise which are directed toward improving all aspects of the activity of the associations and enterprises. It makes it possible to regulate the influence of various factors on increasing production efficiency. Within the framework of this system they solve the problems of controlling the quality and technical level of products, the fixed capital, the utilization of labor, material and financial resources, technical progress at the enterprise and its social development. The pivotal point of the Krasnodarskiy comprehensive system is material stimulation of the results of the labor of subdivisions of the enterprise (shops, sections, services and so forth) and its individual measures on the basis of a point evaluation which depends on reaching the indicators established by the standards. With minor changes the Krasnodarskiy comprehensive system for increasing production efficiency can be successfully applied in the proposed material incentive mechanism for effective distribution (utilization) of the earned material incentive fund among subdivisions and also workers of the enterprise.

To us it seems inexpedient to establish various conditions and limitations on material incentives. The entire material incentive fund deducted by the enterprise should be used on the basis of bonus provisions (standards) of the enterprise. Conditions and limitations on material incentives have arisen because of the imperfect mechanism for fund forming and the danger of "overstimulating" one enterprise and "understimulating" others. The mechanism for providing incentives to make the plan more difficult makes it possible to refrain from limitations since it provides for a more correct evaluation of the results of the operation of the enterprises.

The application of the new fund forming mechanism will, of course, cause certain difficulties. The main one is overcoming the psychological barrier which appears when radical changes are made in the evaluation of the activity of the enterprises and they are divided into leading, average and backward ones. It is also possible for situations to arise wherein individual enterprises will have an unjustifiable increase in the amounts of bonuses and awards paid from the material incentive fund because of essential structural changes in production, the value form of fund forming indicators and price factors.

In order to overcome these difficulties it will apparently be necessary to change the priority policy in the area of the distribution of capital investments and material, labor and financial resources. Additionally, one should think about the question of creating a system for forming a centralized material incentive fund in the branches and the USSR Gosplan in order to render assistance

to those enterprises which are temporarily operating inefficiency. This will help to avoid reorganizing them in cases where that would be inexpedient.

The provision of incentives to adopt more difficult plans is directed toward achieving high final national economic results and, on the basis of this, increasing public wealth, which is one of the main goals of a developed socialist society. It will strengthen the system of planning and control of production (this is very important when the scope of production is constantly growing and economic ties are becoming more complicated) and will provide for the creation of material incentives for labor collectives to adopt and fulfill more difficult planned assignments. The proposed mechanism for incentives is constructed on a comparison of expenditures and results of labor at enterprises and in branches and a correct combination of personal, collective and public interests. Its utilization in the system of economic management will contribute to carrying out the historic tasks set by the 26th CPSU Congress.



11772
CSO: 1828/18

## RAPID MATERIALS HANDLING MECHANIZATION URGED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 9, Sep 82 pp 92-96

/Article by A. Shadyyev, deputy chief of USSR Gosplan subdivision, candidate of economic sciences, and P. Krylov, senior expert of USSR Gosplan: "Reducing Manual Labor--A Most Important Factor in Efficiency"/

/Text/ The decisions of the 26th CPSU Congress envision: accelerating the rates of comprehensive mechanization and automation of production processes in all branches of the national economy; considerably reducing the proportion of manual labor in industry; providing for the entire increase in output of enterprises with the same number of fewer workers; reducing transportation expenditures as a result of eliminating inefficient shipments; and providing for comprehensive mechanization of lifting-transportation, loading-unloading and warehouse work.

Our country has achieved certain successes in the production of lifting and transportation machines and equipment in recent years. Under the 10th Five-Year Plan the volume of their output increased 1.4-fold and in 1980 amounted to 2.9 billion rubles. This made it possible to raise the level of mechanization of lifting and transportation work by 8 percent, to increase labor productivity by 3 percent and to release about 60,000 workers who were engaged in manual labor.

Still the volumes and rates of production of lifting and transportation equipment are not keeping up with the growing needs for this in the branches of the national economy. In 1980 this demand was satisfied by an average of 65-70 percent, and for such kinds as automatic and electric loaders--by 35 percent. The average annual rates of increase in the production of loading and transportation equipment are decreasing. An average of about 30 percent of the overall number of workers are employed in lifting-transportation, loading-unloading and warehouse work. As compared to 1975 the number of people employed in these jobs increased by 400,000. Expenditures involved in lifting-transportation, loading-unloading and warehouse work reached 25-30 billion rubles a year. Intra-industry movement of cargo accounts for 75 percent of expenditures for live labor, and only about 20 percent goes for maintaining fixed capital. This is explained by the low machine availability for labor and the inefficient structure of the fleet of lifting and transportation equipment. The value of this equipment per 1 transportation or warehouse worker in industry as a whole is about 2,000 rubles, and in basic production--7,000 rubles. In ground nonrail transportation, for example, up to 70 percent

of the cost is for means that require manual labor for loading and unloading, in which about 60 percent of the workers that service this transportation are employed.

The structure of lifting and transportation equipment does not meet the demands placed on it. It has little effect on increasing the labor productivity of workers employed in moving cargo.

The problem of developing lifting and transportation machine building is crucial also because of the fact that the reduced natural growth of the population makes it necessary under the 11th Five-Year Plan to provide for almost all of the increase in production volumes as a result of increasing labor productivity.

Intensification of production is possible on the basis of replacing heavy, less skilled manual labor with machine labor. This raises an important task: to provide for efficient and intelligent utilization of the labor of workers and to increase the rates of labor productivity, especially in cargo moving processes.

The existing situation is also exacerbated by the fact that centralized planning involves only 45-47 percent of the lifting and transportation equipment that is produced in the country. In particular, the plan for the production of industrial products, according to the products list planned by the USSR Gosplan during the period from 1967 through 1980, the list of lifting and transportation equipment products increased by only 6 percent, and it does not indicate the type, models and names of new kinds of machines for moving cargo which are in short supply. Of the 165 assignments for producing equipment and means of mechanization for moving cargo included in this plan, more than 120 envision the production of crane equipment.

The shortcomings in the planning of lifting and transportation equipment and mechanization have made it necessary to develop a comprehensive program for the development of mechanization and automation of lifting and transportation, loading and unloading and warehouse work in the branches of the national economy during 1981-1985. It was prepared during 1980-1981 by the USSR Gosplan, the State Committee for Science and Technology and the Gossnab with the participation of more than 70 ministries and departments that were involved.

The program takes into account the fact that the development of lifting and transportation machine building is directly conditioned by the requirements of technical progress in all branches of the national economy. When selecting alternative directions and also determining the scope and time periods for conducting the necessary work, the initial base that was used consisted of the most important problems facing the national economy. These problems include primarily:

increasing the availability of technical equipment for labor;

introducing everywhere comprehensive mechanization and automation of production processes and steadily reducing the number of workers employed in less productive, heavy manual labor;

introducing scientific organization of labor and increasing its efficiency;

re-equiping industry with technical equipment more rapidly, creating and extensively introducing highly productive technical equipment and means of automation, and improving their structure;

consistently changing over to mass application of highly efficient systems of machines and technological processes that provide for comprehensive mechanization and automation of production;

economizing on metal and fuel and energy resources;

eliminating nonproductive expenditures and losses in production;

improving control of economic processes and further orienting them toward the achievement of the best final results.

Exceptional importance has been attached to the creation of the program. A goal has been set to determine the major directions of the development of lifting and transportation machine building and to reduce the amount of manual labor in practically all branches of the national economy.

The program was developed in several stages. In the first of them the USSR Gosplan prepared documents that regulate the policy for drawing it up and earmarked goals and criteria for structural construction which were then submitted to the ministries, departments and councils of ministers of the union republics. The documents included methodological instructions for creating a comprehensive program, forms and indicators, the main uses for materials and the schedules for delivering them. There was a conference of the higher and middle levels of management of the ministries and departments that participated in its development. Then comprehensive programs were drawn up locally. These were drawn up by scientific research, planning-technological and other institutes and organizations.

Special attention was devoted to the organizational and executive system which provides for the implementation of the measures in the programs and includes agencies of administrative and economic organizations. A commission and subcommissions were created for drawing up the comprehensive program. The mechanism for its formation included units of various levels. The work was headed by the central coordinating commission. It considered the most important problems, and also discussed the provision of methodological materials. It also guided the activity of the subcommissions that exercised operational control over the course of the development of the subprograms. The functions of organization and control of the activity were carried out locally by working groups headed by deputy ministers.

A great deal of significance was attached to the initial data for forming the comprehensive program. They determined the initial level and stages of mechanization of the processes of moving cargo in branches of the national economy, forms of manual labor, the proportions of it, the most expedient

means of mechanization and automation for lifting and transportation, loading and unloading and warehouse work, and also the need for these means. It was also necessary to obtain information about the production capacities, resources and achievements of science and technology as well as indicators of the effectiveness of the utilization of means of mechanization.

During the past 20 years the level of mechanization has constantly risen and at the present time in inter- and intrashop cargo flows it amounts to almost 90 percent. But this high indicator does not fully reflect the state of affairs with respect to the condition of mechanization, not to mention the unsatisfactory methods of determining it. For example, in 1981 at enterprises of industry and construction the overall volume of lifting and transportation work amounted to 31.2 billion tons. And approximately 1 percent of the cargo was moved by hand, without machines and mechanisms, which required the labor of about 4 million people. This is what happens when there is a shortage of technical equipment.

Increased availability of technical equipment for labor requires a significant acceleration of the rates of development of production of means of mechanization and automation for lifting and transportation, loading and unloading, and warehouse work. Therefore a central element in the program is the totality of subprograms: for the technical level and production of means of production, the development and creation of new kinds of lifting and transportation equipment, and so forth.

During the 11th Five-Year Plan the volume of output of equipment for mechanization and automation of lifting and transportation, loading and unloading and warehouse work in the branches of the national economy (according to the products list planned by the USSR Gosplan) will increase by 32 percent. It is intended to develop the production of loaders at accelerated. Their output will increase (in physical terms) by 36.8 percent and the total cargo capacity will double. The production of containers will increase 1.5-fold, including in the Ministry of Heavy Machine Building (containers with a net weight capacity of 20 tons and more) where this production will increase more than 5-fold.

A special-purpose scientific and technical program has been developed as a section of the comprehensive program for new technical equipment. It envisions series production of more than 30 groups of machines and batching items for them, and also the creation and assimilation of more than 25 new kinds of general-purpose lifting and transportation equipment and batching items.

Moreover, the manufacture of specialized lifting and transportation equipment is earmarked in the corresponding programs for transportation, agriculture and construction. Thus the Ministry of Heavy Machine Building envisions the creation of bridge cranes with a lifting capacity of from 5 to 50 tons of lightweight structures when they are used on new frameless carts, which will make it possible to reduce their proportional metal-intensiveness by 15-30 percent. Under the 11th Five-Year Plan the Ministry of the Electrical Equipment Industry will assimilate a number of universal electric loaders with a lifting capacity of 1-2 tons, and also cargo carriages with transverse movement with lifting capacities of 1.25 and 2 tons. These measures will provide for increased productivity of the machines for ground nonrail transportation by 10-20 percent and will create conditions for improving the technology of cargo handling in the processes of moving cargo.

In order to expand the sphere of application of automatic loaders and to economize on fuel, and also to meet the specific requirements of the clients, the Ministry of the Automotive Industry intends to develop modifications of base automatic loaders: with diesel engines, with systemic neutralization of exhaust fumes, with engines that operate on liquid gas and with special cargo loading mechanisms.

One of the most important tasks of the Ministry of Construction, Road and Municipal Machine Building is to develop the production of cranes with special chasis, air filled tires and tower cranes with a large cargo capacity. It is intended to manufacture machines for expanding mechanization of work in transportation, loading and unloading materials, including single-scoop loaders with air filled tires and with cargo capacities of up to 25 tons as well as on the basis of caterpillar tractors with cargo capacities of up to 15 tons, which will increase labor productivity 2-3-fold and reduce the cost of the work by 20-30 percent. They will also assimilate other progressive technical equipment.

Within the framework of the long-term special-purpose program for cooperation in the area of machine building, the USSR and other CEMA countries have developed a program of scientific-technical and economic cooperation for satisfying the needs for means of mechanization of lifting and transportation, loading and unloading and warehouse work. It envisions further development of specialization of industrial production of the CEMA countries in order to increase the output of lifting and transportation equipment.

The main directions of scientific and technical progress in the area of lifting and transportation machine building are: the creation of machines and kinds of drives that use effective new methods of handling the cargo in order to considerably increase labor productivity; the development and manufacture of lifting and transportation equipment that combines the operations of transferring it with technological operations, that is, sets and systems of machines that provide for elimination of nonproductive expenditures and improvement of working conditions; extensive utilization of automated handlers and built-in automated control systems using micro processes and mini computers that eliminate less skilled manual labor; the introduction of automated warehouse complexes controlled by automated systems for control of labor processes; the application in industry of progressive containers and container-packaging equipment; expansion of the list of lifting and transportation equipment on the basis of standardization of the main types of machines; and reduction of the metal-intensiveness and increased reliability and durability of lifting and transportation equipment as a result of the utilization of new materials and high-quality batching items.

Because of the inadequate availability of technical equipment for workers employed in processes of transferring cargo and in basic production, it is necessary to take people from auxiliary jobs. The level of mechanization of labor for transferring cargo in industry is ten-twenty-thirds of the level in basic production. While in the latter reserves for reducing manual labor have been practically exhausted, in processes of moving cargo they are significant and therefore to realize them will produce a great effect.

Warehousing plays a significantly larger role under the conditions of intensification of production. The warehouse is no longer simply a place to store cargo; it involves all processes of the arrival and dispatch of materials and batching items, their preliminary preparation and their delivery to production. The role of warehousing is becoming a more and more important factor in the organization of the production process which affects the work rhythm of all units of the enterprise. This is why it is so important to have accelerated introduction of automated warehouse complexes that are controled by automated systems.

It is immensely important to use industrial robots and automated manipulators for lifting and transportation, loading and unloading and warehouse work. This will make it possible to release hundreds of thousands of workers employed in heavy physical manual labor. Under the 11th Five-Year Plan robots will be used on a wide scale.*

The party and government are devoting a great deal of attention to the development of lifting and transportation machine building. At the present time the country's national economy has progressive new kinds of this technical equipment. Thus at the Cherepovets, Krivoy Rog and Novolipetsk metallurgical combines they are successfully using unique conveyor systems that provide for continuous automatic placement of charges in the throats of high-powered blast furnaces. In the chemical, food, automotive and other branches of industry they are extensively applying complexes of scraper and vibration machines. Their advance consists in that in addition to mechanization of processes of transferring cargo, they reduce the pollution of the atmosphere with dust that is harmful for the health of the people.

Mechanization and automation of lifting and transportation, loading and unloading and warehouse work in all branches of the national economy has raised a number of problems not only in selecting the most efficient lifting and transportation machines, but also in implementing organizational measures among the consumers of this technical equipment. A remarkable peculiarity of modern production is the ever closer interweaving and interdependency of the main technological processes and operations for moving cargo. In connection with the increased volumes of production, as technological operations brought about by specialization are broken up, their is a considerable increase in the number of movements of cargo between operations. This pertains especially to large series and mass production. Means of mechanization of the movement of cargo are becoming the factor which largely controls the course of the production process, and at the working position they considerably determine the organization of the labor of the worker. Means of mechanization exert an influence on the distribution of technological equipment, the sequence and the corresponding grouping of the technological process of production, and they determine the work rhythm of the industrial enterprise.

The structures of the commodity turnover of machine building enterprises of various profiles are not the same in terms of their indicators and with the

*On the production and application of industrial robots, see: V. Lebedev, "The Development of the Production of Industrial Robots and Manipulators in 1981-1985," PLANOVOYE KHOZYAYSTVO, 1982, No 6.

mechanization of processes of moving cargo they require various systems of mechanization and various lifting and transportation equipment, begining with the simplist means of minor mechanization and ending with automated lifting and transportation systems that operate according to a given program. What with modern production being saturated with new, highly efficient means of mechanization, traditional kinds of rail, automotive and other kinds of intra-plant transportation are increasingly being replaced by automated systems of lifting and transportation machines and robots, and the development and creation of optimal systems for mechanization and automation of processes of moving cargo acquire decisive significance.

These circumstances bring to the fore the problem of improving methods of control of mechanization and automation of lifting and transportation, loading and unloading and warehouse work in the branches of the national economy. Each enterprise, ministry and department will have to deal constantly with problems of increasing the mechanization and automation of processes of moving cargo, which requires specialized subdivisions that are responsible for doing this work. This is brought about by the need to solve the following problems:

the creation and introduction in each branch of standard systems for comprehensive mechanization and scientific organization of the labor of workers employed in lifting and transportation, loading and unloading and warehouse work;

The introduction of all-encompassing technology for cargo handling--from the receipt of the materials and purchased items to the dispatch of the final product;

optimization of processes of moving cargo, that is, extensive application of moving cargo without transshipment within and among enterprises and improvement of the organization of cargo flows;

expansion and application of package and container shipments;

revision of the structure of the fleet of means of mechanization for movement and more efficient operation of it;

improvement of operational planning of the processes of cargo movement, the development of schedules and routes for cargo flows, and the creation of an automated control system for the movement of cargo;

reduction of idle time on machines and mechanisms;

the development of technical assignments for creating new kinds of lifting and transportation equipment.

Accelerated production of lifting and transportation equipment requires a unified technical policy. Correct distribution and operation of the machines are also important. Only with a close alliance between the manufacturers and consumers of this technical equipment can one achieve an optimal structure and efficient utilization of the fleet of this equipment.

In order to carry out successfully the tasks for producing and introducing lifting and transportation equipment, obviously, it is necessary to have a coordination center. The first steps in this direction have already been taken--a division for mechanization and automation has been organized in the State Committee for Science and Technology and a decision has been made to create a similar subdivision in the USSR Gosplan.

The comprehensive program for the development of mechanization and automation of lifting and transportation, loading and unloading and warehouse work in the national economy during the period of 1981-1985 is only the beginning of a large amount of complicated work for reducing the application of manual labor in the branches of the national economy. The fulfillment of the assignments envisioned by this program will create a basis for the development of lifting and transportation machine building under the 12th Five-Year Plan. The implementation of the comprehensive program will make it possible to release approximately 1.2 million people from heavy manual work in industry, construction, agriculture, trade, transportation and material and technical supply in 1981-1985.



11772
COS: 1828/19

## EFFICIENCY OF MACHINE VERSUS DIRECT LABOR WEIGHED

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA EKONOMICHESKAYA in Russian
No 5, Sep-Oct 82 pp 41-53

/Article by V. V. Kocherygin, "The Question of the Effectiveness of Replacing Live Labor With Machines"/

/Text/ We are considering the problem of the effectiveness of replacing manual labor with machine labor, taking into account the peculiarities of the development of the national economy as a unified national economic complex. As a method of investigation we are using the flow theory: Quantitative relationships are determined on the basis of the model of expanded reproduction of fixed capital according to the data of the interbranch balance for 1972.

In Soviet economic literature a good deal of attention has been devoted to various aspects of replacing live labor with machines. But nonetheless certain issues still cause large disputes /5/, which is explained by the complexity of the problem itself and its multifaceted nature.

This problem is especially crucial at the present time when the party has set the task of further increasing the efficiency of public production on the basis of accelerated scientific and technical progress and the elimination of less skilled and heavy labor by means of improving and technically re-equipping industry and introducing machines, mechanisms and industrial robots.

The problem of the effectiveness of replacing live labor with machines has acquired primary significance also because in recent years there has been a reduction in the rates of growth of labor productivity and return from fixed capital and capital investments.

When studying questions of replacing manual labor with machines it is necessary, in our opinion, to single out certain aspects that characterize the various aspects of public production, whose elements are undoubtedly the introduction and expansion of the application of new technical equipment and the replacement, reconstruction and technical re-equipment of industry. First of all one should consider the nature of this process not only from the standpoint of individual, particular phenomena, but also in the entire totality of the measures that have been implemented and their influence on public production. One should further

reveal the peculiarities of this process under the conditions of intensification of production, which has considerably increased the requirements placed on the utilization of all resources. It is obvious that the mechanism for replacing live labor with machines should be analyzed in connection with the methods of planning and economic administration.

The labor aspects predetermine the value aspects to a large degree. The shortage of labor force that has been observed in recent years deforms the existing structure of value relations. And this process is manifested more rapidly and more appreciably in the area of wages. This influence is reflected with a certain delay, but fairly clearly in the change in product values as well. Thus the average wage increase per one percent of increased labor productivity during the 10th Five-Year Plan exceeded the ratio that existed under the 9th Five-Year Plan, during which there was an increase in the wage rates and salaries in industry. And under the 10th Five-Year Plan the growth of the wage fund in practice came closer (and in certain branches of industry even exceeded) the rates of increase in output (Table 1).

Table 1. Ratio Between Growth Rates of Average Earnings, the Wage Fund, Labor Productivity and the Volume of Products Produced in Industry

| | 1961-1965 | 1966-1970 | 1971-1975 | 1976-1980 |
|---|---|---|---|---|
| Increase in wage fund per 1 percent of increase in production volume, %. | 0.74 | 0.94* | 0.73** | 0.97 |
| Increase in average earnings per 1 percent increase in labor productivity, %. | 0.55 | 0.87* | 0.64** | 0.82 |

*Period of economic reform.
**During these years there were increased wage rates and salaries.

As a rule, in economic literature the problem of replacing manual labor with machines is considered with respect to a specific item and at best to the overall number of machines that are produced. On this basis, models are constructed for updating and establishing prices for new technical equipment which regulate the interrelations between producers and consumers of technical equipment as well as the system of control of the investment process. Yet it is becoming more and more obvious that deepening the scientific substantiation of our plans and economic decisions involves a more careful study primarily of the general phenomena that are manifested in the country's economy as a unified national economic complex, in the changeover from analysis of individual, random phenomena to the study of their total influence on expanded socialist reproduction, and in the improvement of the control of the effectiveness of the investment process on the basis of scientifically substantiated normatives.

The key to understanding the distinguishing features of the individual and total circulation of production capital, the movement of its individual elements and the effectiveness of replacing live labor with machines is provided by the investigation of individual and total capital that was conducted by K. Marx. Analyzing the application of machines in large industry, K. Marx noted: "It is clear that if the production of a certain machine requires the same quantity of labor as is saved by its application, there is simply a redistribution of labor, that is, the overall sum of labor necessary for producing the commodity does not decrease, or the productive force of labor does not increase." [1]

There is no need to prove how obvious this conclusion is, especially when speaking about an individual enterprise (it is precisely these aspects that K. Marx considers in Volume 1 of "Das Kapital"). Indeed, if an enterprise has enlisted labor force for the manufacture of a machine and when the machine has been introduced into production the same quantity of labor has been saved (say an average annual number of 500 men), labor productivity does not increase, that is, the same quantity of final output for the given enterprise (branch) as before will be manufactured with the same labor expenditures. It is quite understandable that the capitalist, for example, who has used this technical equipment would obtain no additional income.

Incidentally, in our statistics the machine manufactured by the labor of the workers is included in the volume of product output. Therefore even when the labor expenditures for the manufacture of the machine are equal to the savings from its application, the indicator characterizing the output of the gross (commodity) or normative net output per one employee increases (Table 2).

Table 2.

| Indicators | Before introduction of machine | After Introduction | |
|---|---|---|---|
| | | Variant 1 savings = expenditures on machine | Variant 2 savings = 0 |
| 1. Production volume, thousands of rubles, | 400 | 420 | 420 |
| including equipment for internal needs | -- | 20 | 20 |
| 2. Labor expenditures, total, thousands of people (annual average) | 10 | 10 | 10.5 |
| including for manufacture of equipment for internal needs | -- | 0.5 | 0.5 |
| 3. Output of products per 1 employee, thousands of rubles | 40 | 42 | 40 |
| 4. Increase in labor productivity | 100 | 105 | 100 |

But in reasoning this way we have proceeded from the conventional assumption that the given machine will serve 1 year, for otherwise such an equality is impossible. But a machine, as a rule, functions for several years. Therefore when studying the effectiveness of the application of a specific implement of labor at a given enterprise, as many researchers usually do, it is possible to arrive at certain conclusions which are typical of only a particular pheonomenon. For example:

1) when expenditures on the manufacture of a machine are equal to the savings from its application within the period of service equal to tn, the overall sum of savings of labor will be Etn, that is, will be tn times more than the expenditures on the manufacture of the machine;

2) since in subsequent years it will not be necessary to expend additional labor force on the manufacture of the machine right up until the time it is replaced in the year tn + 1, even in the second year labor productivity will increase and will be greater than before its introduction;

3) if the need for the given machines becomes generally recognized, the given workers will be able to manufacture several more machines. Then the overall savings will amount to Ettn (in the year tn it will be necessary to manufacture a machine to replace the one that has been withdrawn because of wear and tear).

But we are considering not the manufacture and introduction of a specific machine in a given enterprise or branch, but all of public production where the beginning of the assimilation and output of certain machines coincides with the time of replacement of others that have been removed because of wear and tear and where, consequently, all products which are implements of labor (products of investment branches and industries) always separate into two parts: replacement of products that have been removed and expansion of the production potential.

We are considering the annual cross-section of machine production and the latter means that machines with different times of introduction into operation participate in the formation both of simple and of expanded reproduction: Some of them (new machines) are used for mechanization of manual labor, expansion of production and replacement of outdated machines; others which have been produced for a long time are used to replace similar, previously manufactured machines. Therefore we shall consider not only increased production potential as a result of the introduction of machines that are manufactured for the first time in the given year, but also expansion of production in general which is brought about by the introduction of all machines produced in a given year, that is, expansion of fixed production capital.

And, finally, we shall consider the application of implements of labor manufactured in a given year not only as an element in the process of public reproduction, but also as one of the most important conditions that form the type of expanded socialist reproduction: extensive or intensive. Regardless of the time of manufacture and startup, a machine can create conditions for both extensive expansion of production and for its intensification. For example, the introduction of automated lines to replace manual labor creates the preconditions for the intensification of production while the introduction

of the same line in a new section of the same enterprise means primarily expansion of production. In this case increased effectiveness will depend on the degree to which expenditures are reduced in the enterprise and branch as a whole.

It is also necessary to single out one more aspect of this problem, without whose consideration it would be difficult to evaluate the ratio between labor expenditures on the production of machines and savings from their application in public production. We are speaking about the peculiarities of mass production of machines. The manufacture of machines (especially on a large scale) presupposes in the first place, that all the conditions necessary for this have been created beforehand and, in the second place, that the expenditure of labor directly on the manufacture of the machines does not coincide in time with the point of their introduction and certainly not with the point when their effect is realized. Even if one were to assume that there was no time interval between the production and introduction of all the machines produced in a given year, that is, that the machines were utilized for their intended purpose immediately after being manufactured, even then only half of them would participate in the output of products of the given year and the rest would be in the next year. But, taking into account the time needed for transportation, assembly, assimilation and other factors, for example, the seasonablity of the work, this interval (which has come to be called a lag) reaches large amounts, especially when constructing large new facilities. Hence it follows that in the national economy as a whole expenditures on the manufacture of implements of labor, new machines and equipment are reflected in the results of one time period (year) while the effect from their application will not be reflected until the next or even later periods.

The time difference between the production and utilization of machines somewhat changes the character of the interconnection between expenditures and results. The latter means that the indicator of labor productivity both for the individual enterprise and for the national economy as a whole will reflect greater effectiveness as compared to the preceeding period even if the savings on live labor are less than the expenditures on the manufacture of the machines.

But even if at first glance it is understandable that the time difference between the production and introduction of machines and implements of labor creates the possibility of increasing labor productivity even with a smaller savings on live labor as compared to expenditures on their manufacture, it is not at all clear whether this is achieved as a result of a relative reduction of the potential capabilities of expanding the production of implements of labor in the future.

For example, in 1971-1975, 80 percent of the increase in national income and approximately 82 percent of the increase in the gross social product were obtained as a result of increased labor productivity in the national economy as a whole and this provided for saving the labor of 20 million people. At the same time expenditures on increasing fixed production capital that provides for expansion of production and increased labor productivity, according to our calculations, were equal to expenditures of the labor of approximately 36 million people. In 1976-1980, 75 percent of the increase in national income

and gross social product were obtained as a result of increased labor productivity and the labor of 6 million people was saved. The labor of 35 million people was expended on increasing fixed production capital.

It is obvious that one cannot find an answer to the question of the degree to which this ratio affects the potential of expanded reproduction by analyzing the interconnection between expenditures and results from individual measures or variants of the solution to any technical, managerial or economic problem. Its solution must be sought in the study of the pattern of expanded socialist reproduction and in the analysis of its reproduction structure.

In other words, the influence of the application of machines on increasing efficiency and the ratio between expenditures and savings from their introduction can be correctly understood only on the basis of flow methods [10], and the basic patterns of development and increased efficiency of public production, particularly the ratio between expenditures on the creation of implements of labor and savings from their application--on the basis of an analysis of expanded reproduction of production capital [11].

Flow methods have been dealt with in a fairly detailed way by L. Khorunzh following the example of the process of amortization and replacement of fixed production capital. We shall use these general principles to illustrate the flow of simple and expanded reproduction. As was already staeted above, the increased output of machines and implements of labor in a given year is provided for both as a result of the startup of new and expansion of existing enterprises and as a result of the utilization of the previously created production potential for these purposes. From the standpoint of labor resources this means that not only newly hired workers, but also workers employed in previously created capacities participate in the expansion of the production of implements of labor.

But the possibilities of utilizing existing capacities for increasing the production potential, as we know, are not unlimited. They are related to the cycle of the functioning of machines that have been produced previously, that is, in year tn a given enterprise must already produce machines not for the expansion of their fleet, but for reproduction of previously created ones. And, all other conditions being equal, the shorter the service life of the machines, the less the possibilities of expanding their application as a result of the previously created production potential.

Thus with an average service life of machines of 5 years and a uniform increase in their production, say, 10 percent annually, in year t + 1 (where t--the service life of the machines) the ratio between accumulation and replacement will be 0.61, that is, only 39 percent of the machines produced in the given year can be used for expansion of reproduction; the rest will be used to replace those that have been withdrawn because of wear and tear.[1]

A similar picture can be observed, for example, in the production of many agricultural machines. In 1980, 117,500 grain harvesting combines were delivered to agriculture, but the fleet of these machines increased by only 15,800 and 13.4 percent of the machines that were delivered were used for

expansion of the fleet. During the same year agriculture received 9,300 sugar beet harvesting combines, but the fleet of machines decreased from 67,000 to 62,000.

With longer service lives of machines or when machines that are being produced are replaced by more productive ones, the ratio between accumulation and replacement changes, with an increase in the proportion of accumulation. Conversely, a reduction of the rates of increase leads to a reduction of the proportion of machines that are capable of increasing the production potential. This is precisely the process that has been observed in recent years. This is shown, for example, by the growth rates of machine building and the amounts of capital investments. While under the 9th Five-Year Plan the growth rates of machine building products amounted to 77 percent, under the 10th it was 52 percent, and capital investments in group A of industry were 43 percent and 32 percent, respectively.

But under actual conditions implements of labor have various service lives and therefore the entire list of products, like all implements of labor that are to be replaced in a given year, and also the proportion of products of the investment branches that are to replace and expand production can be determined on the basis of the flow method, and the movement of their value--on the basis of data concerning the introduction and withdrawal of fixed capital.

From what has been said above one can draw the following conclusions pertaining to the entire national economy as a unified complex:

1. Direct labor expenditures on the creation of implements of labor that contribute to expansion of the production potential are determined not by expenditures on the manufacture of products of the investment branches and industries,[2] produced in a given period and not by their annual increase, but by labor expenditures on the manufacture of machines and implements of labor that provide for expansion of production.[3] Actually the number of people employed in construction and assembly work and in machine building comprise approximately one-third of the people employed in material production and savings on labor, for example, during the 10th Five_Year Plan exceeded the increase in the number of workers in these branches almost 3-fold. Consequently, the ratio between savings on labor or its increased productivity is determined by expenditures not on the creation of all implements of labor in a given period, but only those on expansion of the production potential and increased productive force of labor.

2. The possibilities of expansion of the production potential of investment branches are determined by the same conditions as in any other branch, that is, the availability of additional sources of raw materials, processed materials, fuel, energy, implements of labor and labor force. Thus this sector of material production like, incidentally, all material production, can be developed on an intensive and an extensive basis.[4]

3. An increase in the production of means of production in general and implements of labor (in investment branches) for the production of means of production and objects of consumption, in particular, mean an increase in the gross social product and the nationla income. During the period from 1940 through 1980 the gross social product increased 13.6-fold and industrial output--21-fold, including the production of means of production (group A)--29-fold, and national income--14.6-fold. Thus increased production of both industrial output and the entire gross output is provided to a considerable degree as a result of accelerated growth of production of the means of production and even more accelerated growth of means of labor. But an increase in the gross output and national income as a result of increased production of means of labor and, correspondingly, the accumulated part of the income certainly does not mean increased labor productivity and certainly not expansion of the possibilities of raising the standard of living of the workers.

The latter is achieved only when the production of objects of consumption significantly outstrips the increase in the number of people employed in all material production. In other words, the creation of means of labor is not a goal in itself, but a means of increasing labor productivity and increasing the output of the final (not including expenditures on accumulation) product per 1 employee and per capita.

What with the reduced possibilities of utilizing extensive factors in the development of the economy, including increased production of means of labor, ever increasing importance and scope are attached to tasks of increasing the efficiency of public production, economizing in all ways on material, labor and financial resources, and changing over to intensive methods of managing the economy. "In the 1980's," said L. I. Brezhnev at the 25th CPSU Congress, "the solution to this problem will be especially urgent. This is primarily because of the aggravation of the problem of labor resources." /4/

While in the 1950's the increase in the number of workers and employees in the national economy amounted to 53.5 percent and in the 1960's--45.5 percent, in the 1970's this increase was only 24.3 percent. In the 1980's the increase in labor resources will be at a minimum level, mainly as a result of a reduction in the birth rate. Moreover, in a number of regions with highly developed industry there can be an absolute reduction of labor resources. Consequently, labor resources are now being transformed into the most important limiting factor in the development of the economy, and the achievement of high growth rates of output with a minimum increase or even a reduction of absolute amounts of labor expenditures is becoming a most important indicator of the intensification of production. It is also necessary to take into account the circumstance that our economy needs to assimilate remote new areas, mineral deposits with difficult conditions for exploitation, and also further expansion of production in certain regions where there is a surplus of labor. Therefore both the scope of the increase in production, including the production of implements of labor, and the possibilities of improving public well-being and solving social problems will depend on the growth rates of labor productivity in the next few years.

The need to change over to intensive methods of managing the economy was especially emphasized in the decisions of the 26th CPSU Congress. "Intensifying the economy and increasing its efficiency, if this formula were translated into the language of practical actions, consists primarily in making sure that the results of production increase more rapidly than expenditures on it, making sure that it is possible to achieve more while using relatively fewer resources in production. Planning and the scientific-technical and structural policy should serve to solve this problem. Methods of management and the policy in the area of administration should also work for efficiency." [5]

Recently the ministries and departments have done a large amount of work and implemented a number of most important measures for improving the economic mechanism and strengthening its influence on the efficiency of public production. As the practice of operating under the new conditions has shown, in the system of measures for improving the economic mechanism an important position should be allotted to methods of controlling the effectiveness of scientific and technical progress, the investment process, planning and the selection of the most economical decisions, since the results of this improvement in production predetermine to a significant degree the amounts of bonuses and the evaluation of the operation of the enterprises. But methods of evaluating the effectiveness of economic decisions, capital investments, new technical equipment and other measures have still not gone beyond the stage of scientific research, and normatives of effectiveness have not become an important planning indicator or entered the system of scientifically substantiated technical and economic norms and normatives.

A study of the relationship and the location of a quantitative expression of labor expenditures on the production of implements of labor, which comprise the potential for expanded reproduction, and the savings on labor from their application on the basis of the modern structure of public production, taking into account the tasks for increasing its intensification, could, in our opinion, contribute to improving the methods of selecting the calculation of scientifically substantiated normatives of the effectiveness of capital investments, new technical equipment and economic decisions. To do this we shall use the methods for developing the schema of expanded reproduction of production capital,[5] and the data from the interbranch report balance (MOB) for 1972, which make it possible to determine the structure of the value and the make-up of the gross social product and individual subdivisions of it. Additionally, for the calculations we have used certain reference figures which are lacking in our statistics.[6]

The use of the data from the interbranch balance places certain limitations on the possibilities of interpreting the schema. At the same time an analysis of the models of expanded reproduction that have been created on the basis of actual data make it possible to analyze certain patterns in expanded reproduction, taking into account the higher degree of its intensification.

Table 3. Modelling of Economic Development of USSR National Economy in 1973

| | | Prod. Resources (used)** | | | Value of Output, br[2]* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Expend. of public labor C | | | | |
| | Subd. | FC[1] br[2] | MCC[3] br[2] | Labor Expend. avg. regis. no. of employers, millions T | Total | Including amortization $C_a$ | Wages, necessary product[a]v | Added product m | All value of gross product P |
| A | B | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Initial base | I | 535 | 134 | 43.8 | 270.5 | 14.9 | 101 | 83.3 | 454.8 |
| | II | 87 | 53 | 34.9 | 133.3 | 2.4 | 57 | 72.3 | 262.6 |
| | Total | 622 | 187 | 78.8 | 403.8 | 17.5 | 158 | 155.6 | 717.4 |
| Variant 1 -- extensive expanded reproduction | I | 580.4 | 148.5 | 47.1 | 291.3 | 16.6 | 108.8 | 89.6 | 489.7 |
| | II | 94.6 | 56.8 | 32.0 | 142.2 | 2.7 | 60.8 | 77.1 | 280.1 |
| | Total | 675 | 205.3 | 79.1 | 433.5 | 19.3 | 169.6 | 166.7 | 769.8 |
| Variant 2 -- intensive development (90%) of the increase in output through increased labor productivity | I | 580.4 | 148.5 | 44.2 | 291.3 | 16.6 | 101.8 | 96.6 | 489.7 |
| | II | 94.6 | 56.8 | 35.2 | 142.2 | 2.7 | 57.4 | 80.5 | 280.1 |
| | III | 675 | 205.3 | 79.4 | 433.5 | 19.3 | 159.2 | 177.1 | 769.8 |

[1] billions of rubles

[2] fixed capital

[3] material circulating capital

* In 1972, according to data of the MOB, the production of means of production comprised 63.4% of the gross social product, objects for consumption--36.6%; in 1973 these figures were 63.6% and 36.4% respectively. In products of subdivision I the ratio between C and v was characterized by the following figures: 59.5, 22.2 and 18.3%; in products of subdivision II--50.8, 21.7 and 27.5%. The value of the gross social product in 1972 was 717.7 billion rubles and in 1973, 769.8 billion rubles.

** The value of the fixed production capital of subdivisions I and II was determined approximately, from the ratio between capital investments in groups A and B of industry, which occupy a leading position in the gross social product. The number of employees was calculated approximately from the proportion of workers in material production of the overall number of employed population (accounting for kolkhoz

Table 3 (Continued)

| | Expend. on Increasing Prod. Capital, br[1]*** | | | | | |
|---|---|---|---|---|---|---|
| | FC[1] OK | | | MCC[2] OP | | |
| | | Including From | | | Including From | |
| | Total | Natl. Income | Other Sources | Total | Natl. Income | Other Sources |
| B | 9 | 10 | 11 | 12 | 13 | 14 |
| I | 45.4 | 29.9 | 15.5 | 14.5 | 14.5 | |
| II | 7.6 | 4.8 | 2.8 | 3.8 | 3.8 | |
| Total | 53 | 34.7 | 18.3 | 18.3 | 18.3 | |
| I | | | | | | |
| II | | | | | | |
| Total | | | | | | |
| I | | | | | | |
| II | | | | | | |
| Total | | | | | | |

workers but not those employed on private subsidiary farms). It was distributed in proportion to the proportion of wages in subdivisions I and II, taking into account the higher wage level in subdivision I.

***For expenditures on increasing fixed production capital we took the sum of increase of this capital. Part of the capital investments used to increase incomplete construction should be included in the increase in material circulating capital. Other sources of capital investments for increasing fixed capital include part of the amortization deductions (correspondingly in the schema part of the products of subdivision I were used to form this increase.

Increased fixed production capital is taken to mean increased value of functioning implements and means of labor (taking their reporduction circulation into account).

Below, in Table 3, we have given the calculations of the change in the structure of output, production capital and labor force for various individual subdivisions and for public production as a whole under various conditions of reproduction. The first variant of the economic development of the sphere of material production of the USSR in 1973 shows the extensive increase in expenditures on the output of product, that is, a proportional increase of cvP , and also the number of employees T. The extensive variant of expanded reproduction is necessary as a conventional level of economic development for comparison with others variants (similar devices are used, for example, in planning).

The extensive variant of increased expenditures on production can mean not only simple expansion of production on the same technical and organizational basis, but also, for example, the introduction of new implements of labor which do not compensate for the deterioration of natural condition or increased expenditures on the maintenance of the equipment functioning in production as a result of a slowing up of the renewal process. In the first variant labor productivity in the subdivisions of public production does not change.

In the second variant it is assumed that the possibilities of increasing production in the same amounts are limited as a result of a smaller increase in labor resources and that the task of further development of the economy involves an essential increase in labor productivity as a result of increasing the efficiency of the machines and equipment that are used in production and newly introduced and reconstructed enterprises. Additionally, 90 percent of the increase in output should be provided as a result of increased labor productivity.

Calculations from the schema for expanded reproduction of production capital show that a relative savings of labor in the second variant, which reflects intensification of production, should amount to 5.7 million people (recall that under the 10th Five-Year Plan there was a conventional release of 6 million people), and the savings on the wage fund (retaining the average level for 1972) was 10.7 billion rubles, or almost 20 kopeks per ruble's worth of increase in fixed production capital that provides for this savings.[7] It should be noted that the savings on labor provided by such a high level of intensification is approximately equal to expenditures on the creation of the potential for expansion of fixed production capital (the latter being equal to the labor of approximately 5.8 million people).

But the task of increasing the productivity of public labor is carried out differently in industries that provide for expansion of the output of products as a result of the startup of new capacities to augment and expand the extraction and production of raw materials, in newly assimilated regions, in regions with a relative surplus of population, and so forth, and at enterprises that are carrying out reconstruction and technical re-equipment and introducing new technical equipment. The startup of new, even fully automated plants still requires the enlistment of additional labor force. Therefore the expansion of the production of products as a result of the construction of new enterprises, shops and sections, from the standpoint of the utilization of labor resources for the national economy, means extensive development. Increased productivity of public labor is thus achieved to the extent to which the indicators of the new industries will be higher than the average for the branch.

At the present time almost 80 percent of the capital investments are used for the construction of new and expansion of existing industrial enterprises. And even with a considerable increase in labor productivity at new facilities, such an increase in the production of products requires an essential increase in labor expenditures. Under the 10th Five-Year Plan fixed production capital increased by 40 percent. If one assumes that at new enterprises the capital availability for labor as a result of the application of new equipment increases by 20 percent, then the number of employees would have to increase by 12 percent.

The shortage of labor force impedes the startup of new facilities. During the 10th Five-Year Plan almost 1,200 large new enterprises were constructed: a considerable proportion of them were started up late. And one of the main reasons for the delay in the startup of enterprises is the shortage of skilled labor force.

Under the conditions of intensification of production, increased demands are placed on capital investments and especially on expenditures on existing production.

Let us assume that in the national economy as a whole 75 percent of the increase in fixed production capital is new enterprises which provide for the entire increase in the output of products. And labor productivity at the new facilities is 10 percent higher than at existing enterprises[8] and other indicators are also considerably better (output-capital ratio, profitability of production capital and so forth) (Table 4). Then with the same possibilities of increasing the labor force, capital investments in reconstruction, technical re-equipment and new technical equipment at existing enterprises should provide for a savings of labor force in the amount of 5.1 million people and a reduction in the expenditure of wages in the amount of 67 kopeks per 1 ruble of expenditures. Otherwise the tasks of increasing labor productivity, providing for the output of products and other indicators of the plan for economic and social development would not be fulfilled.

When calculating the models of extensive and intensive development of the country's economy, relatively high rates of growth of the gross social product, which were typical of the 9th Five-Year Plan, were used. In 1973 the VOP increased by 7.3 percent as compared to 1972, products of subdivision I--by 7.7 percent and of II--by 6.7 percent. The rates of growth of the gross output under the 10th and 11th Five-Year Plan were somewhat less and the structure of the VOP was different. Does this indicate a reduction of the rates or a change in the ratio of expenditures on the production potential for expanded reproduction of fixed capital and savings on labor from its assimilation? Obviously not. The more so since the ratio calculated for one year on the basis of actual data can hardly fully characterize the peculiarties of the five-year plan, not to mention the complete lengthy period of development.

But it is clear that when the current structure of reproduction is retained the increase in expenditures on the creation of the potential for the expansion of the application of implements of labor will require a constant increase in the production of means of production, including the production of machines, equipment, fixtures, instruments and so forth. While in 1973 the increase in

Table 4. Indicators of New and Existing Enterprises Under Conditions of a Shortage of Labor Force*

| | Production Resources | | | | Gross Social Product, billions of rubles | | |
|---|---|---|---|---|---|---|---|
| | Fixed capital billions of rubles OK | Material circulating capital billions of rubles OP | Number of employees millions T | Expend. of past labor C | Wages (necessary product) | Added product | Total value of product P |
| Subdivision I Enterprises operating in 1972 | -535 | 134 | 43.8 | 270.5 | 101 | 83.3 | 454.8 |
| Changes made by capital investments | +11.4 | -- | -3.0 | -- | -6.0 | +7.0 | -- |
| New enterprises | 34 | 14.5 | 3.4 | 20.8 | 6.9 | 7.2 | 34.9 |
| Total for subdivision I in 1973 | 580.4 | 148.5 | 44.2 | 291.3 | 101.8 | 96.6 | 489.7 |
| Subdivision II Enterprises operating in 1972 | 87 | 53 | 34.9 | 133.3 | 57 | 72.3 | 262.6 |
| Changes made by capital investments | +2 | -- | -2.1 | -- | -3.1 | +3.3 | -- |
| New enterprises | 5.6 | 3.8 | 2.4 | 8.6 | 3.5 | 5.4 | 17.5 |
| Total for subdivision II in 1973 | 94.6 | 56.8 | 35.2 | 142.2 | 57.4 | 80.5 | 280.1 |

*In keeping with this condition (shortage of labor force), 75% of the capital investments in increasing fixed capital are used for the creation of new enterprises; labor productivity is 10% higher at new enterprises than at existing ones, and other indicators are also considerably better (the profitability of production capital at existing enterprises of subdivision I was 12.5% and at new ones--14.8%; in subdivision II these indicators were 51.6% and 57.4%, respectively, and the output-capital ratio and other indicators were also higher). 25% of the capital investments were used for re-equiping existing enterprises. The entire increase in output in 1973 was produced at existing enterprises as a result of the startup of new enterprises.

fixed capital amounted to 53 billion rubles, in 1979 it was 72 billion rubles. During the past 15 years fixed production capital (true, taking into account re-evaluation) increased 3.2-fold, and the gross social product--2.4-fold. A further increase in the potential for the application of implements of labor involved not only expansion of capacities in the output of products in new areas and regions with a relative surplus of labor resources (extensive factor), but also the acceleration of technical progress, the creation of waste free technology and the replacement of natural products and raw materials with synthetic ones, and it also makes it necessary to enlist additional labor force.

It is also necessary to keep in mind that a considerable proportion of the increase in fixed production capital in 1973 was financed from the renovation fund (temporarily delayed demand for the replacement of functioning production equipment).[9] The proportion of these funds in the financing of increased fixed production capital amounted to approximately 18 percent. Moreover, in recent years, despite the significant expansion of the opportunities granted to the enterprises to update production equipment, the rates of replacement of worn-out fixed capital has not yet increased.[10] While in 1970, 1.8 percent of the fixed capital was withdrawn as a result of wear and tear and natural disasters, in 1979 this figure was 1.4 percent.

But the process of renewal is impeded, as we know, by increased expenditures on capital repair and expansion of structural subdivisions that are engaged in maintaining existing capital in working condition. These subdivisions typically have individual and small-series production, considerable expenditures of manual labor and high production costs which exceed the value of a new machine.

All-around expansion of reconstruction and technical re-equipment of existing enterprises is one of the most important factors in providing for intensification of production. This process involves a change not only in the use of capital investments, but also in the structure of production. It is also possible that accelerated renewal of production equipment will cause an increase in the proportion of liquidated capital that is not completely amortized. All this can lead to a relative increase in expenditures on simple and expanded reproduction, that is, to a change in the relationship between expenditures and results.

At the same time one should consider another aspect of this problem. In recent years certain economists have been trying to subdivide the factors in increasing the efficiency of production into investment and noninvestment factors, that is, the latter being those not related to capital expenditures. In fact, if one takes the plan for organizational and technical measures of any enterprise, in it one can find both the introduction of new machine tools and machines, and purely organizational measures that contribute to increasing labor productivity and economizing on material resources with practically no capital expenditures (the introduction of standard designs for the organization of the working position, brigade forms of labor organization, the application of new forms of wages, and so forth).

But let us look at the other side of this. Take, for example, the labor of an ordinary ditch digger with an ordinary shovel. Hardly anyone would try to prove that this labor has become more productive during the past 50 or 100 years even

taking into account the latest forms of organization and incentives for labor. It is obvious that improvement in the organization of labor, production and administration is directly related to the development and improvement of technical equipment and technology. Note that in past years this problem too has been solved more and more comprehensively. Principles of scientific organization of labor are included in the plans for new enterprises and equipment and during the introduction of new technical equipment. Thus, on the general plane practically any noninvestment measure involves a change in the material base of socialist production in one way or another.

The analysis that has been conducted of the effectiveness of replacing manual labor with machines makes it possible to draw the conclusion that for the country's entire economy as a unified national economic complex the relationship between expenditures and results is determined not by individual peculiarities of the dependency of the effect on the amount of capital expenditures, not on the total effectiveness of models of new technical equipment that have been selected by individual enterprises, and not by indicators of individual branches and industries. It is determined primarily by the nature of expanded socialist reproduction under modern conditions and can be recognized on the basis of an analysis of this.

In order to control a socialist planned economy it is important to develop the system of scientifically substantiated technical-economic norms and normatives. It is obvious that the time has come to include in this system normatives that contribute to a correct determination of the priorities in the development of the branches and economic regions in order to insure progressive changes in national economic proportions and increased efficiency of capital investments and of all public production.

At the levels of the enterprises, associations, ministries and departments these normatives should contribute not only to increasing the demands on planning decisions, increasing the effectiveness and improving the utilization of capital expenditures, but also to essentially improving the methods of selecting economic decisions and reducing the number of less effective plans for construction projects, new machines and equipment. They should reflect the progressive directions of scientific and technical progress and be based on the possibilities of utilizing the production potential and cooperating in the area of scientific research and production with other countries, primarily socialist ones.

When developing such normatives one should fully account for the peculiarites of expanded socialist reproduction of the intensive type and the need for constantly expanding production on the basis of an all-around increase in labor productivity and increased efficiency in the utilization of labor, material, financial and all natural resources in order to satisfy the growing demands of the society.

FOOTNOTES

1. In general form, with an average service life of the machines of tn, the index of production increase is S = 1.1; the volume of production of the machines in the year t, less than 2, will be equal to $P_0S^t$, the volume of replaced machines -- $P_0S^{t-tn}$, and the ratio between accumulation and replace ment in the year of output of the machines -- $\frac{P_0S^t - P_0S^{t-tn}}{P_0S^{t-tn}}$.

2. Investment production is taken to mean the manufacture of machines for internal consumption at machine building enterprises.

3. In this case, if a new, more productive machine replaces an outdated one, one takes into account the difference in labor expenditures on their manufacture or the growth of fixed production capital.

4. The theoretical possibilities of expanding the production potential and the potential of expanded reproduction ($v_1 + m_1 - c_1$ or $P_1 - c_1 - c_{II}$) on an extensive basis or as a result of increased labor productivity have already been shown in the investigation by K. Marx and F. Engels of models of expanded reproduction of public capital. As we know, K. Marx in Vol II of Das Kapital investigates expanded reproduction of public capital of the extensive type, where v and c are increased in the same proportion [2]. As distinct from this, V. I. Lenin proposed a schema for expanded reproduction which envisions increased labor productivity with a simultaneous change in the value of the product [3]. While in the former case 100 percent of the increase in gross social product and, correspondingly, the potential for expanded reproduction are achieved as a result of increased expenditures of labor (and other resources), in the latter schema only 67.5 percent of the gross social product and 44.5 percent of the production of means of production are achieved this way. Hence it is possible to assume that the potential for expanded reproduction could also increase as a result of the same increase in labor productivity at enterprises that produce means of production, or with new, more productive capacities.

5. We have presented the methods for calculating the schema for expanded reproduction of fixed production capital in [10]. Here let us only clarify that it is consumed capital that is analyzed in the Marxist schemata. Applied capital and the mechanism of its reproduction which continue to function remain outside consideration. In the schemata of expanded reproduction considered previously and also in this work, along with the movement of consumed capital (reflected in the value of the gross social product) one also considers the movement of advance capital (fixed capital and material circulating capital), which considerably expands the possibilities of analyzing the patterns in the development of public production.

6. The rough calculations presented in Table 3 of the structure of the value of fixed capital in various individual subdivisions and also of labor expenditures undoubtedly affect the precisions of the normatives. But we have set the task of determining normatives of capital investments that are suitable for practical utilization. This requires figures and calculations for the conditions of the Eleventh Five-Year Plan or the more distant future.

7. If one simultaneously sets the task of saving only 1 percent of the material resources, for 1 ruble of increase in fixed production capital the savings will amount to 23 kopecks.

8. In practice it frequently turns out to be the opposite. Thus because of of shortcomings in the plans, the level of mechanization of labor was lower at a number of recently introduced flax plants of Belorussia than at existing enterprises. The planned effeciency of certain new textile enterprises and the return from fixed capital were less than the average for the branch. For example, according to the plan for the construction of the Chaykov Combine for Silk Fabrics imeni 50 Letiye SSSR the indicator of efficiency (ratio between profit and estimated cost of construction) should have been 0.22 and the Kamyshinsk cotton fabric combine -- 0.32, that is, less than the average profitability of the branch. And in reality the indicators of efficiency were lower than planned -- one-third to one-fourth of the planned level.

9. According to the data of V. K. Senchagov, V. V. Ostapenko and V. A. Malyayev, in recent years 40-50 percent of the renovation fund has been used for expansion of production [12].

10. The expansion of the rights of the enterprises to use profit and part of the amortization fund for renovation for accelerated technical re-equipment, as we see, has not yet produced the desired results. The small amounts of these funds in the hands of the enterprises hardly make it possible to organize a radical restructuring of production. This will contribute rather to a dispersion of funds and a prolongation of the time periods for re-equipment. At the present time reconstruction and technical re-equipment should be carried out in a planned way, on a statewide scale. The assignments for their fulfillment should be included in the state plan and branch plans. The latter requires concentration of resources for these purposes.

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11772
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EDUCATION

## TRAINING OF CONSTRUCTION SPECIALISTS QUESTIONED

Moscow PRAVDA in Russian 28 Sep 82 p 3

[Discussion between V. P. Il'yin, rector of Leningrad Engineering and Construction Instiute and A. S. Krivov, deputy director of Leningrad Scientific Research Institute of Scientific Planning: "Dialog on Construction Specialists", Leningrad]

> [Text] Today, the training of the modern engineer requires that vuz instructors combine efforts with the industrial, planning or research organizations where the graduates will be working. What does such collaboration afford? Is it always mutually beneficial? What problems arise? At the request of the editors of "Pravda", these issues were discussed by V. P. Il'yin, rector of Leningrad Engineering and Construction Institute and A. S. Krivov, deputy director of Leningrad Scientific Research Institute of Scientific Planning.

[Krivov] Your institute's graduates have a good reputation. They are always welcomed workers at construction sites, and in planning or scientific research organizations. This is clearly the result of the tremendous experience gained by the vuz over its 150 year history. No small part is played by providing a clear-cut idea of the modern construction engineer, or as they now say in high school, the "model of a specialist". This model evidently also serves as a guide in the day--to-day scientific and educational activities.

[Il'yin] That is generally true, but we can not say that everything is totally clear. As you know, we are faced with problems on many levels. We want the institute graduate to be an active citizen, a cultured, educated person, a broad specialist, and at the same time, to completely assimilate the profound knowledge and basics of craftsmanship in the field he chooses. How can we combine this versatility?

For example, do we give our students adequate specialization? They only pick their major in their last year. As you know, some of our graduates go to planning organizations, others become craftsmen or foremen at construction sites. There is an inevitable process of adaptation, of course, but proper training can make it easier.

We have come to the conclusion that the department of industrial and civil engineering, for example, needs two specializations: construction designer and construction technologist. The first steps in this direction have already been taken and we have been granted permission to re-organize.

[Krivov] But as experience shows, thorough specialization only gives positive results when there is a cooperative effort, when the mechanism of close interaction is attuned to an understanding of both the specific and the general problems encountered in organizing the urban environment.

A close link-up is impossible if each engineer is limited by his own narrow range of special problems; for example, if a builder is only concerned about how easily he can put up a facility and ignores wider architectural and city-building issues; or if a planner does not understand or take into account the important aspects of construction technology. It is even worse when an architect only provides a rough blueprint of an architectural design, relying on the inventiveness and experience of engineer, but he himself only has a vague notion of the overall design.

[Il'yin] So, tell me, do our graduating architects have enough experience in the construction field?

[Krivov] Not quite. You know, it's not enough just to acquire knowledge about the characteristics of reinforced concrete, metal, lumber and other designs, you have to understand the principle of organic structural and tectonic design, where a design is governed by both structural considerations and by architectural expression. That is why we should introduce into the curriculum some sort of course to help the student learn to take a comprehensive approach to building design.

[Il'yin] That's worth considering. Sometimes we come across a dissertation that has a blueprint for an efficient design, a planetarium for example, but it is not made clear how the thing is to be built.

But even ideal organization of coursework and laboratory exercises inside the four walls of an institute can not prepare graduates for rapid and successful adaptation to the working group. Students must be given the maximum opportunity to really become familiar with current working conditions.

In this regard, I must admit that everything hasn't gone smoothly for us. Our institute was recently called on the carpet because many graduates assigned to construction sites don't stay there very long before leaving to go to institutions and planning institutes. We took note of this criticism and we're now taking more care to prepare students for future on-site work.

First of all, we are improving the organization of production practices. Formerly, after the second year, students visited the shops of enterprises, seeing how cement and reinforced concrete were manufactured, how metal was produced. Those trips were not that useful.

Third-year students went to work in brigades as concrete workers, stone masons, plumbers. After one year, students were already working as back-up men for craftsmen and foremen, even temporarily filling those jobs. Finally, in their last year they would run around looking for blueprints which they could use to fulfill their degree requirements.

We reviewed this structure, and basically changed the format of the first and fourth years. Second-year students now attend lectures on production; they have become part of the training process. In return, we have closer control over their technological and organizational administrative practices, and at the same time the necessary preparation for the dissertation is given.

The time saved in this manner we have used to provide students with exposure to practical construction work -- the participation in student construction detachments. I must note that our pupils exhibit good business characteristics, they work like the craftsmen and chief engineers in the detachments of other vuzes. Many of them have proven themselves to be clever production leaders.

[Krivov] But, you know, a successful course on industrial practices doesn't depend on the vuz alone. The recipient organizations and enterprises are certainly responsible for much of it...

[Il'yin] In theory, of course, this is true, but in reality industrial workers do not consider supervision of practice to be their duty. They are not interested in it from a material standpoint, and what's most important, they do not view the students as their future assistants. After all, nobody knows where the young specialist will be sent on work assignment.

[Krivov] Many of your graduates, I know, generally leave the Leningrad area, but our city has a particularly great need for qualified personnel.

[Il'yin] The fact of the matter is that the shortage of construction and architectural specialists is acutely felt throughout the country, especially in the outlying regions. But many of our "clients" get small groups of graduates - one or two per agency, true? That kind of scattering doesn't help anyone.

I think every vuz has to define its circle of "clients", calculate their specialist requirements, and make assignments two or three years before graduation. Then a bilateral agreement can be drawn up with each base enterprise. We will prepare personnel for them, and in turn, they will ensure that they have effective practices for their future workers.

[Krivov] I think we should understand the principle of mutual obligations in a broader sense. You know, the young specialist approaches his job with trepidation, and sees that everything in the field does not match up with the ideal notions he developed in school. Isn't that one of the reasons why vuz graduates don't remain long in the construction administrations, and seek more suitable work for themselves?

[Il'yin] Unfortunately, that's true. We don't have to look very far for examples. The construction of the new training laboratory of LISI gave students a clear lesson on how not to build. The workers of the 40th administration of Trust No. 19 of Glavleningradstroy worked for an entire year laying the concrete foundations for this building, carrying cement in wheelbarrows. In the year they completed only 80,000 rubles worth of work out of some 280,000 rubles of capital investments. But if this type of coincidence is an unfortunate accident, then the construction mess is a rather wide-spread thing; and it is, of course, reflected in the mind of journeyman and young specialist.

By and large we can not fail to be alarmed at the low level of education of the leaders of our construction jobs. Suffice it to say that in Glavleningradstroy, over half of the heads of construction administrations do not have vuz diplomas. Meanwhile, the institute opens its doors wide to industrial workers of all ranks and ages. We have a night school, there are training courses, a department for improving the qualifications of technical and engineering personnel, and ad hoc courses on vital problems are set up.

But we still do not see a serious enough attitude toward training on the part of many responsible comrades. They feel that they can cut classes or drop out completely. We obviously had to exert a stronger party influence on these managers.

Which aspects of instruction do you feel we should focus on?

[Krivov] With regard to the modern stage of city building, we must thoroughly understand the importance of standardization, unification and typification. When the student studies the history of architecture, of course, he becomes familiar with world-class specimens of architecture and construction and he unwittingly begins to dream of creating brilliant, distinctive creations. But he must clearly realize that beauty today rests on a different, broader foundation, that the individual can not set himself off from the mass, and he must feel in his heart that esthetic problems can not be resolved without considering the social and economic consequences.

Your graduates are lucky to have such professions--very responsible ones. What their fate will be largely depends on the knowledge and human values imparted to future builders and architects while they are in school.

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DISTRIBUTION OF POPULATION BY SOURCES OF INCOME

Moscow VESTNIK STATISTIKI in Russian No 9, Sep 82 pp 79-80

[Text] SOURCE OF INCOME

Table 1. Distribution of Entire Population, Men and Women According to Sources of Income, in USSR and Union Republics[1]

| | | Including | | | | | |
|---|---|---|---|---|---|---|---|
| | All population | Employed population (except in private subsidiary farming) | Employed in private subsidiary farming | Recipients of stipends | Pensioners and others supported by the state | Dependants of individuals | People with other sources of income who did not indicate source |
| USSR | 262084654 | 134859651 | 563991[2] | 6632991 | 40125978 | 79630782 | 271261 |
| Men | 121868127 | 67865860 | 52908 | 3262540 | 12612398 | 37971368 | 103053 |
| Women | 140216527 | 66993791 | 511083 | 3370451 | 27513580 | 41659414 | 168208 |
| RSFSR | 137409921 | 74246723 | 212597 | 3474101 | 22563864 | 36763371 | 149265 |
| Men | 63208265 | 37282499 | 16070 | 1594304 | 6776036 | 17482441 | 56915 |
| Women | 74201656 | 36964224 | 196527 | 1879797 | 15787828 | 19280930 | 92350 |
| Ukrainian SSR | 49609333 | 25838840 | 162097 | 1233657 | 9089608 | 13228787 | 56344 |
| Men | 22616317 | 12811033 | 20047 | 631642 | 2905985 | 6227736 | 19874 |
| Women | 26993016 | 13027807 | 142050 | 602015 | 6183623 | 7001051 | 36470 |
| Belorussian SSR | 9532516 | 4981753 | 26398 | 251030 | 1589898 | 2675830 | 7607 |
| Men | 4421166 | 2490172 | 3090 | 120592 | 502060 | 1302147 | 3105 |
| Women | 5111350 | 2491581 | 23308 | 139438 | 1087838 | 1373683 | 4502 |
| Uzbek SSR | 15389307 | 6201077 | 18126 | 401013 | 1342728 | 7415542 | 10821 |
| Men | 7556147 | 3188444 | 1547 | 235716 | 491611 | 3634262 | 4567 |
| Women | 7833160 | 3012633 | 16579 | 165297 | 851117 | 3781280 | 6254 |
| Kazakh SSR | 14684283 | 6892349 | 35573 | 390189 | 1518533 | 5834097 | 13542 |
| Men | 7075637 | 3589049 | 1606 | 197692 | 539019 | 2743096 | 5175 |
| Women | 7608646 | 3303300 | 33967 | 192497 | 979514 | 3091001 | 8367 |

Table 1. (Continued)

| | All population | Including | | | | | |
|---|---|---|---|---|---|---|---|
| | | Employed population (except in private subsidiary farming) | Employed in private subsidiary farming | Recipients of stipends | Pensioners and others supported by the state | Dependants of individuals | People with other sources of income who did not indicate source |
| Georgian SSR | 4993182 | 2519204 | 12995 | 114937 | 663616 | 1675950 | 6480 |
| Men | 2338870 | 1260267 | 1530 | 62128 | 224158 | 788506 | 2281 |
| Women | 2654312 | 1258937 | 11465 | 52809 | 439458 | 887444 | 4199 |
| Azerbaijan SSR | 6026515 | 2634876 | 11927 | 180199 | 505821 | 2688354 | 5338 |
| Men | 2933374 | 1364597 | 1173 | 104988 | 165695 | 1294658 | 2263 |
| Women | 3093141 | 1270279 | 10754 | 75211 | 340126 | 1393696 | 3075 |
| Lithuanian SSR | 3391490 | 1749467 | 14756 | 93225 | 518980 | 1010751 | 4311 |
| Men | 1599439 | 881101 | 1921 | 48843 | 186441 | 479245 | 1888 |
| Women | 1792051 | 868366 | 12835 | 44382 | 332539 | 531506 | 2423 |
| Moldavian SSR | 3949756 | 2059854 | 12667 | 80294 | 542664 | 1250466 | 3811 |
| Men | 1864747 | 1024793 | 1747 | 36625 | 190631 | 609489 | 1462 |
| Women | 2085009 | 1035061 | 10920 | 43669 | 352033 | 640977 | 2349 |
| Latvian SSR | 2502816 | 1371608 | 6244 | 56406 | 430265 | 635116 | 3177 |
| Men | 1151463 | 677927 | 808 | 28639 | 146349 | 296470 | 1270 |
| Women | 1351353 | 693681 | 5436 | 27767 | 283916 | 338646 | 1907 |
| Kirghiz SSR | 3522832 | 1493181 | 7194 | 82665 | 358073 | 1578584 | 3135 |
| Men | 1708097 | 776523 | 708 | 42825 | 126424 | 760574 | 1043 |
| Women | 1814735 | 716658 | 6486 | 39840 | 231649 | 818010 | 2092 |
| Tajik SSR | 3806220 | 1493174 | 22281 | 69993 | 287768 | 1931368 | 1636 |
| Men | 1880521 | 781187 | 811 | 46081 | 111970 | 939832 | 640 |
| Women | 1925699 | 711987 | 21470 | 23912 | 175798 | 991536 | 996 |
| Armenian SSR | 3037259 | 1440807 | 8693 | 128949 | 262219 | 1194102 | 2489 |
| Men | 1477899 | 742143 | 1017 | 69074 | 90153 | 574429 | 1083 |
| Women | 1559360 | 698664 | 7676 | 59875 | 172066 | 619673 | 1406 |
| Turkmen SSR | 2764748 | 1138378 | 9412 | 46804 | 206864 | 1361981 | 1309 |
| Men | 1358911 | 598560 | 367 | 29167 | 74746 | 655523 | 548 |
| Women | 1405837 | 539818 | 9405 | 17637 | 132118 | 706458 | 761 |
| Estonian SSR | 1464476 | 798360 | 3031 | 29529 | 245077 | 386483 | 1996 |
| Men | 677274 | 396565 | 466 | 14224 | 81120 | 182960 | 939 |
| Women | 787202 | 400795 | 2565 | 15305 | 163957 | 203523 | 1057 |

Notes to Table 1.

1. A continuation of the publication of the census results in the magazine VESTNIK STATISTIKI (beginning in Nos 2, 6-12 for 1980; Nos 1, 2, 4, 5, 11 and 12 for 1981; Nos 1 and 7 for 1982).

2. This list includes only individuals for whom the private subsidiary farm is the main source of income.

Table 2. Distribution of Entire Population, Men and Women According to Sources of Income in the USSR and Union Republics

| | Percentages | | | | | |
|---|---|---|---|---|---|---|
| | Employed population (except in private subsidiary farming) | Employed in private subsidiary farming | Recipients of stipends | Pensioners and others supported by the state | Dependants of individuals | People with other sources of income who did not indicate source |
| USSR | 51.5 | 0.2 | 2.5 | 15.3 | 30.4 | 0.1 |
| Men | 55.7 | 0.0 | 2.7 | 10.3 | 31.2 | 0.1 |
| Women | 47.8 | 0.4 | 2.4 | 19.6 | 29.7 | 0.1 |
| RSFSR | 54.0 | 0.2 | 2.5 | 16.4 | 26.8 | 0.1 |
| Men | 59.0 | 0.0 | 2.5 | 10.7 | 27.7 | 0.1 |
| Women | 49.8 | 0.3 | 2.5 | 21.3 | 26.0 | 0.1 |
| Ukrainian SSR | 52.1 | 0.3 | 2.5 | 18.3 | 26.7 | 0.1 |
| Men | 56.6 | 0.1 | 2.8 | 12.9 | 27.5 | 0.1 |
| Women | 48.3 | 0.5 | 2.2 | 23.0 | 25.9 | 0.1 |
| Belorussian SSR | 52.2 | 0.3 | 2.6 | 16.7 | 28.1 | 0.1 |
| Men | 56.3 | 0.1 | 2.7 | 11.3 | 29.5 | 0.1 |
| Women | 48.7 | 0.5 | 2.5 | 21.3 | 26.9 | 0.1 |
| Uzbek SSR | 40.3 | 0.1 | 2.6 | 8.7 | 48.2 | 0.1 |
| Men | 42.2 | 0.0 | 3.1 | 6.5 | 48.1 | 0.1 |
| Women | 38.4 | 0.2 | 2.1 | 10.9 | 48.3 | 0.1 |
| Kazakh SSR | 46.9 | 0.3 | 2.7 | 10.3 | 39.7 | 0.1 |
| Men | 50.7 | 0.0 | 2.8 | 7.7 | 38.8 | 0.1 |
| Women | 43.4 | 0.5 | 2.5 | 12.9 | 40.6 | 0.1 |
| Georgian SSR | 50.4 | 0.3 | 2.3 | 13.3 | 33.6 | 0.1 |
| Men | 53.9 | 0.1 | 2.7 | 9.5 | 33.7 | 0.1 |
| Women | 47.4 | 0.4 | 2.0 | 16.6 | 33.4 | 0.2 |
| Azerbaijan SSR | 43.7 | 0.2 | 3.0 | 8.4 | 44.6 | 0.1 |
| Men | 46.5 | 0.0 | 3.6 | 5.7 | 44.1 | 0.1 |
| Women | 41.1 | 0.3 | 2.4 | 11.0 | 45.1 | 0.1 |
| Lithuanian SSR | 51.6 | 0.4 | 2.8 | 15.3 | 29.8 | 0.1 |
| Men | 55.1 | 0.1 | 3.1 | 11.6 | 30.0 | 0.1 |
| Women | 48.4 | 0.7 | 2.5 | 18.6 | 29.7 | 0.1 |

Table 2. (continued)

| | Percentages | | | | | |
|---|---|---|---|---|---|---|
| | Employed population (except in private subsidiary farming) | Employed in private subsidiary farming | Recipients of stipends | Pensioners and others supported by the state | Dependants of individuals | People with other sources of income who did not indicate source |
| Moldavian SSR | 52.1 | 0.3 | 2.0 | 13.8 | 31.7 | 0.1 |
| Men | 54.9 | 0.1 | 2.0 | 10.2 | 32.7 | 0.1 |
| Women | 49.7 | 0.5 | 2.1 | 16.9 | 30.7 | 0.1 |
| Latvian SSR | 54.8 | 0.2 | 2.3 | 17.2 | 25.4 | 0.1 |
| Men | 58.9 | 0.1 | 2.5 | 12.7 | 25.7 | 0.1 |
| Women | 51.3 | 0.4 | 2.1 | 21.0 | 25.1 | 0.1 |
| Kirghiz SSR | 42.4 | 0.2 | 2.3 | 10.2 | 44.8 | 0.1 |
| Men | 45.5 | 0.0 | 2.5 | 7.4 | 44.5 | 0.1 |
| Women | 39.5 | 0.4 | 2.2 | 12.7 | 45.1 | 0.1 |
| Tajik SSR | 39.2 | 0.6 | 1.8 | 7.5 | 50.8 | 0.1 |
| Men | 41.5 | 0.0 | 2.5 | 6.0 | 50.0 | 0.0 |
| Women | 37.0 | 1.1 | 1.2 | 9.1 | 51.5 | 0.1 |
| Armenian SSR | 47.4 | 0.3 | 4.2 | 8.7 | 39.3 | 0.1 |
| Men | 50.2 | 0.1 | 4.7 | 6.1 | 38.8 | 0.1 |
| Women | 44.8 | 0.5 | 3.9 | 11.0 | 39.7 | 0.1 |
| Turkmen SSR | 41.2 | 0.3 | 1.7 | 7.5 | 49.3 | 0.0 |
| Men | 44.1 | 0.0 | 2.2 | 5.5 | 48.2 | 0.0 |
| Women | 38.4 | 0.6 | 1.3 | 9.4 | 50.2 | 0.1 |
| Estonian SSR | 54.5 | 0.2 | 2.0 | 16.8 | 26.4 | 0.1 |
| Men | 58.7 | 0.1 | 2.1 | 12.0 | 27.0 | 0.1 |
| Women | 50.9 | 0.3 | 2.0 | 20.8 | 25.9 | 0.1 |



11772
CSO: 1828/23

# ECONOMIST EVALUATES PUBLIC HEALTH OUTLAYS

Moscow EKONOMICHESKIYE NAUKI in Russian No 10, Oct 82 pp 61-68

/Article by V. Korchagin, doctor of economic sciences: "An Economic Health Fund"/

/Text/ As public production becomes more complicated, the role of health protection as a factor in the well being and development of the main productive force--the working person--is constantly increasing. Under conditions where the advantages of socialism are combined with the achievements of the scientific and technical revolution, the development of the health protection system has become an indispensible attribute of economic growth and the insurance of a healthy way of life has become a condition for full-value productive activity.

One can single out two trends in research on economic problems of public health: the study of conditions for the functioning of the health protection system and the determination of its interconnections with the economy. The first direction concentrates on internal patterns in the system of health protection: changes in the corresponding expenditures in the country as a whole and per one resident, individual expenditures of labor, materials and fixed capital, the distribution of health protection institutions, and so forth. The second direction is oriented toward external conditions of the development of health protection: its position in the economic system, social and economic results of the development of health protection, and so forth. This direction also includes the question of macro-economic evaluations of the population and labor resources from the standpoint of health. This issue has been less developed and an attempt will be made to advance toward its solution in this article.

When speaking about the public health system one should have in mind primarily its extensive socio-economic goals under socialism without reducing these to a purely economic effect. The latter should be regarded as something that accompanies the broad social results; at the same time it fully returns those expenditures which society makes on the development of public health.

It is very important to establish the proportions between the development of health protection and the national economy. One can approach the study of these by determining the quantitative expression of the economic health fund which is considered in interconnection with economic growth.

The term "economic health fund" (EFZ) reflects the sum of expenditures on medical service for the population that have been made throughout the life of individual citizens or generations of people. The amount of the EFZ can be calculated as of any date, for example, at the time of the census. And the economic evaluation is subjected to aspects of maintaining health--expenditures on its protection. The correctness of this approach is determined primarily by the fact that the health of the population is a multifaceted category which must be considered both in its social and in its economic aspects.

It is known that the health of the population is studied by various scientific disciplines: social hygiene and health protection organization, population economics, demography and medicine itself. One should emphasize the exceptional importance of the direct study of the health of the population on the basis of the corresponding medical and biological evaluations of various age groups. Here one can form indicators that are suitable for dynamic characterizations and also for comparing regions and countries.[1] There is still a very large amount of work to do in this area, however.

Additionally, economic science has its own subject in research on health of the population. This is conditioned by the fact that the health of the population cannot be interpreted as an isolated biological phenomenon: It should be regarded as a totality of the properties of man that are conditioned not only by his biological nature, but also by the method of production. The subject of economic study of health is the material basis and the reproduction aspects. The maintenance of a certain level of health of the population requires that the society invest economic resources and their application makes the corresponding economic evaluations necessary. All this is directly related to the economic health fund.

When calculating the EFZ one distinguishes the current (annual) and cumulative (a number of years) expenditures of public labor on medical service for the population. Calculations of the EFZ rely on revealing relative annual norms of consumption of medical services for various age groups. It is known that the expenditure of resources on protecting the health of the population of various age groups differ during the course of any year since the needs for medical service change from one age group to another. According to the data of G. A. Popov the need of the population aged 60 years and older for outpatient polyclinics, expressed in the number of equivalent units per one resident per year, exceeds the age group of 14-19 years 3.4-fold, and for inpatient assistant--3.5-fold, and for inpatient psychiatric assistance--almost 60-fold, and so forth.[2] The relative indicators of the need for medical service of the population in various age groups are presented in Table 1.

In our calculations we used for a unit the demand of the population (only urban) 20-40 years of age. And it is assumed that the distribution of the entire population with respect to the demand for medical service is U-shaped. Another assumption is that the demand for medical service of the population of individual age groups changes with time. The cost evaluation of an equivalent unit of medical services determined with respect to the conditions of one year or another that is being investigated.

Table 1. Relative Indicators of Demand for Medical Service of Population of Various Age Groups

| Indicators | Age Groups, yrs. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-1 | 1-2 | 3-6 | 7-13 | 14-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60 yrs & older |
| Evaluation system of G. A. Popov* | 2.5 | 2.0 | 0.8 | 0.5 | 0.3 | 0.6 | 0.7 | 0.7 | 0.8 | 1.2 |
| Evaluation system from data of I. V. Pustovoy** | 4.3 | 3.5 | 2.9 | 1.3 | 0.9 | 0.9 | 1.1 | 1.5 | 2.2 | 4.7 |
| Evaluation system adopted in this research | 3.7 | 3.0 | 1.2 | 0.8 | 0.4 | 0.9 | 1.1 | 1.1 | 1.2 | 1.8 |

*Popov, G. A. "Voprosy teorii i metodiki planirovaniya zdravookhraniya" /Questions of the Theory and Methods of Planning Health Protection/, Moscow, 1967, p 280.

**Golovteyev, V. V., Kal'yu, P. I., Pustovoy, I. V., "Osnovy ekonomiki sovetskogo zdravookhraneniya" /Fundamentals of Economics of Soviet Health Protection/, Moscow, 1974, p 197.

It is obvious that the entire sum of current expenditures on health production made during year j is distributed among the population of various age groups according to their number and "weight" depending on the relative annual norm of consumption of medical services.

Let us assume that $C_{ij}$ is the value of medical service during the source of j year of one person in i age group; $P_{ij}$--the number of population in i group in j year. Correspondingly, the current expenditures $Z^t$ of j year can be represented as the sum of expenditures in all of the age groups, that is,

$$Z_j^t = \sum_{i=0}^{n} C_{ij} \cdot P_{ij} \qquad (1)$$

In turn $C_{ij} = C_{ej} \cdot e_i$, where $C_{ej}$--the value of the equivalent unit of medical service (in the group of population taken for a unit in j year, and $e_i$--the number of equivalent units of medical service in i group. Hence

$$Z_j^t = \sum_{i=0}^{n} C_{ej} \cdot P_{ij} \qquad (2)$$

Using the data concerning the amount of current expenditures, the distribution of the population among the various age groups and the relative values of the demand for medical service of people of various ages presented above, one can determine that

$$C_{ej} = \frac{3_j^t}{\sum_{i=0}^{n} e_i \cdot P_{ij}} \qquad (3)$$

The numerator in this formula is the indicator of current expenditures on health protection (it is determined from state statistical data). The denominator is the calculated amount of the relative demand of the population in j year for medical service (in equivalent units).

According to our calculations, the relative demand of the population for medical assistance (in equivalent units) in 1959 was 249.24 million units, and in 1970--280.73 million units. In 1960-1970 the population increased by 15.7 percent, and the relative demand for medical assistance--by 12.6 percent. Consequently, there was a certain reduction of the relative demand of the population for medical assistance. This was brought about mainly by the reduction in the birth rate, and on the basis of this, the smaller proportion of children in the population--the age group with the highest indicators of relative need for medical service. The influence of this factor was not compensated for during this period by an increase in the proportion of elderly people, that is, people who also have a high relative demand for medical service.

Table 2. Calculation of Value Expression of Equivalent Unit of Medical Service

| Indicator | 1959 | 1970 | 1978 | 1970 in % of 1959 | 1978 in % of 1970 |
|---|---|---|---|---|---|
| Relative demand of population for medical service (in equivalent units), millions | 249.24 | 280.70 | 306.30 | 112.6 | 109.10 |
| Expenditures on health protection from state budget and other sources, not including capital investments, billions of rubles | 5.40 | 11.20 | 16.40 | 207.40 | 146.40 |
| Expenditures on health protection per capita, rubles | 25.86 | 46.33 | 62.81 | 179.10 | 135.60 |
| Expenditures on equivalent unit of medical service | 21.66 | 39.90 | 53.85 | 184.70 | 134.20 |

Calculations show that during 1971-1978 the relative demand for medical service increased: The factor of "aging of the population" had an influence. According to our data an increase in expenditures on health protection from the state budget and other sources during 1971-1978 was caused by the increase in population of 18 percent, the change in the age structure of 4 percent, and the increase in resource availability for health protection of 78 percent.

A comparison of expenditures on health protection and indicators of the relative need of the population for medical service made it possible to determine the value expression of the equivalent unit. It amounted to 21.66 rubles in 1959, 39.90 in 1970 and 53.85 rubles in 1978 (see Table 2). We also evaluated the cost amount of the equivalent unit of medical service for a longer period. The corresponding data are presented in Table 3.

Table 3. Indicators of Calculated Values of Cost Expression of Equivalent Unit of Medical Service for the Population, rubles

| Years | Indicators | Years | Indicators |
|---|---|---|---|
| 1900-1913 | 1.52 | 1952 | 14.30 |
| 1914-1922 | 1.29 | 1953 | 15.17 |
| 1923 | 1.42 | 1954 | 16.10 |
| 1924 | 1.57 | 1955 | 17.08 |
| 1925 | 1.73 | 1956 | 18.12 |
| 1926 | 1.89 | 1957 | 19.22 |
| 1927 | 2.11 | 1958 | 20.40 |
| 1928 | 2.33 | 1959 | 21.66 |
| 1929 | 2.57 | 1960 | 22.89 |
| 1930 | 2.83 | 1961 | 24.19 |
| 1931 | 3.13 | 1962 | 25.56 |
| 1932 | 3.44 | 1963 | 26.99 |
| 1933 | 3.80 | 1964 | 28.52 |
| 1934 | 4.20 | 1965 | 30.15 |
| 1935 | 4.64 | 1966 | 31.87 |
| 1936 | 5.12 | 1967 | 33.69 |
| 1937 | 5.65 | 1968 | 35.61 |
| 1938 | 6.20 | 1969 | 37.64 |
| 1939 | 6.55 | 1970 | 39.90 |
| 1940 | 6.90 | 1971 | 41.40 |
| 1941-1945 | 6.90 | 1972 | 42.95 |
| 1946 | 7.80 | 1973 | 44.56 |
| 1947 | 8.80 | 1974 | 46.23 |
| 1948 | 9.94 | 1975 | 48.00 |
| 1949 | 11.23 | 1976 | 49.80 |
| 1950 | 12.70 | 1977 | 51.66 |
| 1951 | 13.47 | 1978 | 53.85 |

The next step in the investigation of the economic health fund was the determination of the cumulative expenditures, that is, the accumulated sum of expenditure on medical service for the population. Cumulative expenditures are nothing other than the sum of the actual expenditures throughout the life of the people:

$$Z^{h'}_{ij} = \sum_{i=0}^{k} \left[ C_{e(j-k)} \cdot e_0 + C_{e(j-k+1)} \cdot e_1 + C_{e(j-k+2)} \cdot e_2 + \ldots + C_{e}j \cdot e_k \right], \qquad (4)$$

where $Z^{h}_{ij}$--the sum of expenditures on medical service of one person in i age group in j year.

For example, in order to determine the cumulative expenditures on medical service for one 40-year-old person in 1978 one should total the corresponding actual expenditures made on medical service for people of this generation for each of the past 40 years. The results of the calculation show, in particular, that the cost of medical service per one 40-year-old person was 972.78 rubles in 1978 (born in 1938) as compared to 624.88 rubles in 1970 (born in 1930) and 308.61 rubles in 1959 (born in 1919).

The cumulative expenditures on medical service for the population of other age groups were calculated in the same way.

The cumulative expenditures on medical service for the entire population in j year, or the economic health fund of the entire population, were calculated as the sum of the corresponding expenditures per capita in i age group for the number of people in this group in j year or

$$Z^{n^c}_{ij} = \sum_{i-0}^{k} Z^{n'}_{ij} \cdot P_{ij}, \qquad (5)$$

where $Z^{n^c}_{ij}$--cumulative expenditures on medical service for the total population in j year.

Cumulative expenditures on medical service for the entire population of the USSR in 1978 were more than 233.28 billion rubles as against 60.15 billion rubles in 1959 and 139.78 billion rubles in 1970. Table 4 gives the corresponding calculations of the economic health fund for 1959 and 1970. The economic health fund increased almost 3.9-fold during 1960-1978. During the course of 1971-1978 it increased at approximately the same rates as fixed nonproduction capital did.

We also determined the structure of the economic health fund and its amount going for the population of working age, that is, 16-59 (for women--16-54), and also the population who are infants and children (from 0-16 years) and elderly: 60 (women--55) years and older. The calculations show that in 1978 57.2 percent of the economic health fund went for the population of working age, and 24.2 percent for the elderly population, and there was a steady tendency toward increase in the proportion of elderly people in the overall amount of the fund (see Table 5).

Table 4. Calculation of the Economic Health Fund of the USSR Population

| Age Groups | 1959 | | | 1970 | | |
|---|---|---|---|---|---|---|
| | Cumulative Expenditures Per 1 Person, Rubles | Amount of Population, Millions of People | Economic Health Fund, Billions of Rubles | Cumulative Expenditures Per 1 Person, Rubles | Amount of Population, Millions of People | Economic Health Fund, Billions of Rubles |
| 0-4 | 169.00 | 24.3 | 4.16 | 316.43 | 20.5 | 6.50 |
| 5-9 | 251.82 | 22.0 | 5.54 | 462.24 | 24.5 | 11.32 |
| 10-14 | 250.78 | 15.3 | 3.84 | 498.67 | 25.0 | 12.47 |
| 15-19 | 242.11 | 16.5 | 3.70 | 458.57 | 22.0 | 10.09 |
| 20-24 | 237.62 | 20.3 | 4.82 | 464.98 | 17.1 | 7.75 |
| 25-29 | 278.41 | 18.2 | 5.07 | 490.64 | 13.8 | 6.77 |
| 30-34 | 275.53 | 19.0 | 5.24 | 559.95 | 21.1 | 11.73 |
| 35-39 | 297.75 | 11.6 | 3.45 | 607.09 | 16.6 | 10.08 |
| 40-44 | 318.96 | 10.4 | 3.32 | 639.75 | 19.0 | 12.15 |
| 45-49 | 338.67 | 12.3 | 4.17 | 663.85 | 12.2 | 8.10 |
| 50-54 | 361.72 | 10.4 | 3.76 | 696.92 | 9.1 | 6.34 |
| 55-59 | 382.00 | 8.7 | 3.32 | 731.90 | 12.0 | 8.78 |
| 60-69 | 439.00 | 11.7 | 5.14 | 884.30 | 17.9 | 15.82 |
| 70-79 | 545.00 | 6.2 | 3.38 | 1034.00 | 8.0 | 8.27 |
| 80-89 | 674.00 | 1.6 | 1.08 | 1137.00 | 2.6 | 3.00 |
| 90-99 | 820.00 | 0.2 | 0.16 | 1256.00 | 0.3 | 0.39 |
| 100 years and over | 960.00 | 0.02 | 0.02 | 1380.00 | 0.02 | 0.03 |
| Total | --- | --- | 60.15 | --- | --- | 139.78 |

Table 5. Indicators of Economic Health Fund of USSR Population According to Age Group

| | 1959 | | 1970 | | 1978 | | % | | |
|---|---|---|---|---|---|---|---|---|---|
| | billions of rubles | % of total | billions of rubles | % of total | billions of rubles | % of total | 1978, % of 1959 | 1970, % of 1959 | 1978, % of 1970 |
| Economic health fund of entire population | 60.15 | 100 | 139.78 | 100 | 233.28 | 100 | 387.8 | 232.4 | 166.9 |
| Including: | | | | | | | | | |
| Before working age | 14.36 | 23,9 | 32.31 | 23.1 | 43.43 | 18.6 | 302.4 | 225.0 | 134.4 |
| Working age | 34.45 | 57.3 | 75.58 | 54.1 | 133.51 | 57.2 | 387.5 | 219.4 | 176.6 |
| After working age | 11.34 | 18.8 | 31.89 | 22.8 | 56.34 | 24.2 | 496.8 | 281.2 | 176.7 |

In addition to the proportions that have been considered one should also analyze the ratios that have taken form within the economic health fund of the able-bodied population. First of all it is necessary to single out that part that goes for the population employed in the national economy, and also the proportion of students, housewives and other able-bodied population.

In our calculations we conventionally assumed that the distribution of the economic health fund among the aforementioned groups corresponds to the distribution of labor resources in the various spheres of employment. The economic health fund of the employed population was determined in the following amounts: 28.3 billion rubles in 1959, 64.9 billion in 1970 and 113.5 billion rubles in 1978 (see Table 6). Additionally, we determined the production part of the economic health fund, that is, the economic health fund for labor resources in the sphere of material production which is calculated on the basis of the proportions of the distribution of the employed population between material production and the nonindustrial sphere. The proportion of the industrial part of the economic health fund was 39.4 percent in 1959, 35.8 percent in 1970 and 36.3 percent in 1978.

Table 6. Calculation of the Economic Health Fund for Labor Resources in Material Production and the Nonindustrial Sphere

| | Billions of Rubles | | | % | | |
|---|---|---|---|---|---|---|
| | 1959 | 1970 | 1978 | 1978, % of 1959 | 1970, % of 1959 | 1978, % of 1970 |
| Economic health fund for people of working age | 34.45 | 75.58 | 133.51 | 387.5 | 219.4 | 176.6 |
| Proportion of population of working age employed in the national economy | 82.1 | 85.9 | 85.1 | -- | -- | -- |
| Economic health fund for employed population | 28.3 | 64.9 | 113.5 | 401.1 | 229.3 | 174.9 |
| Proportion of employed people in material production | 83.7 | 77.1 | 74.4 | -- | -- | -- |
| Economic health fund for labor resources in material production | 23.7 | 50.0 | 84.4 | 356.1 | 211.0 | 168.8 |
| Proportion of employed people in nonindustrial sphere | 16.3 | 22.9 | 25.6 | -- | -- | -- |
| Economic health fund for labor resources in nonindustrial sphere | 4.6 | 14.9 | 29.1 | 632.6 | 323.9 | 195.3 |

A comparison of the economic health fund with the amount of national income produced in one year or another makes it possible to judge a kind of "return" on this fund. According to our calculations, per 1 ruble of the economic health fund for labor resources in the sphere of material production in 1959 there were 5.7 rubles of national income produced, in 1970--5.8 rubles, and in 1978--5.0 rubles. Thus while in 1960-1970 there was a certain increase in the "return" from the economic health fund, in subsequent years it decreased.

The indicators of the economic health fund of the population are among the economic evaluations of the population and labor resources. Along with data concerning the educational and skill level, they produce "an evaluation of the macroeconomic potential"[3] of the population and labor resources which can be used for characterizing social reproduction and also for modeling the analysis and prediction of economic growth.

Guided subsequently by the methodology of theoretical analysis of economic evaluations of the population and labor resources that were developed by A. I. Anchishkin, we note that the dynamics of the economic health fund have been influenced by two factors: the annual expenditures on medical service increase this fund, and the natural loss of population (death) decrease it. At the present level of development of economic knowledge we do not have the ability to calculate factors of "obsolescence" of the economic health fund.[4]

Taking the effect of the aforementioned factors into account, during 1960-1978 the growth of the economic health fund of the entire population amounted to 173 billion rubles, and the sum of expenditures--193 billion rubles. Consequently, 89.6 percent of the sum of expenditures brought about an increase in the economic health fund, and 10.4 percent of this sum of expenditures comprised losses. The process of the accumulation of the economic health fund in comparison with the growth rates of the population, fixed capital and national income determine the increasing economic significance of the health factor. The physical volume and dynamics of the population and labor resources under the conditions of the scientific and technical revolution are no longer enough to characterize the role of this subjective factor in the reproduction process. The dynamics of the economic health fund essentially augment the description of this role and can be successfully used in economic calculations and comparisons.

The last step in our investigation of the problem of the volume, dynamics and structure of the economic health fund consists in determining the amount of its reproduction value.[5] Using the methods of our calculations we learn that each individual of i age group consumes during the period from 0-i years medical services in the volume of

$$\sum_{i=0}^{k} e_i .$$

And the sum of output by the population in various age groups in the year j under investigation on the cumulative consumer force of the population of a given age group determines the relative cumulative consumer force of the entire population or

$$e_j^n = \sum_{i=0}^{k} (\Sigma e_i \cdot P_{ij}). \qquad (6)$$

The relative cumulative consumer force of the entire population in our calculations is shown in Table 7.

Table 7. Calculation of the Restoration Value of the Economic Health Fund of the Population

| Years | Relative cumulative consumer power of the population, millions of units | Value of equivalent unit of medical service, rubles | Restoration value of the economic health fund in prices, billions of rubles | | | |
|---|---|---|---|---|---|---|
| | | | Corresponding years | 1959 | 1970 | 1978 |
| 1959 | 7343.7 | 21.66 | 159.1 | 159.1 | 293.0 | 393.2 |
| 1970 | 8999.7 | 39.90 | 359.1 | 194.9 | 359.1 | 481.8 |
| 1978 | 10076.9 | 53.85 | 539.5 | 218.3 | 402.1 | 539.5 |

The restoration value of the economic health fund is determined as the product of the value of an equivalent unit of medical service and the relative cumulative consumer power of the entire population or

$$Z_{ij}^b = e_j^n \cdot C_{ej} \qquad (7)$$

According to our calculations the restoration value of the economic health fund in 1978 exceeded the value in current prices approximately 2.3-fold, and in 1959 and 1970--2.6-fold and 2.5-fold, respectively. Calculations of the restoration value of the economic health fund are presented in Table 7.

Investigation of the economic health fund, in our opinion, creates the necessary methodological bases for studying important aspects of the efficiency of public production.

FOOTNOTES

1. Concerning this see: Bayevskiy, R. M., "Prognozirovaniye sostoyaniy na grani normy i patologii" [Prediction of Conditions at the Boundary of the Norm and Pathology], Moscow, 1979.

2. See: Popov, G. A., "Voprosy teorii i metodiki planirovaniya zdravookhraneniya" [Questions of the Theory and Methods of Planning Health Protection], Moscow, 1967, pp 273-285.

3. Anchishkin, A. I. " Prognozirovaniye rosta sotsialisticheskoy ekonomiki" [Predicting the Growth of the Socialist Economy], Moscow, 1973, p 165.

4. A. I. Anchishkin attaches a great deal of significance to the factor of obsolescense of education (see: Anchishkin, A. I., op. cit., p 191).

5. Following A. I. Anchishkin, we are applying certain concepts that have been developed by economic theory and practice for examining fixed capital. The restoration value of EFZ is an amount estimated not from actual annual expenditures, but from those that correspond to the situation in the year under investigation: one hypothetically determines the amount of expenditures of economic resources, based on the value of an equivalent unit of service in the year under investigation, would be necessary in preceding years in order to obtain the same social result.



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